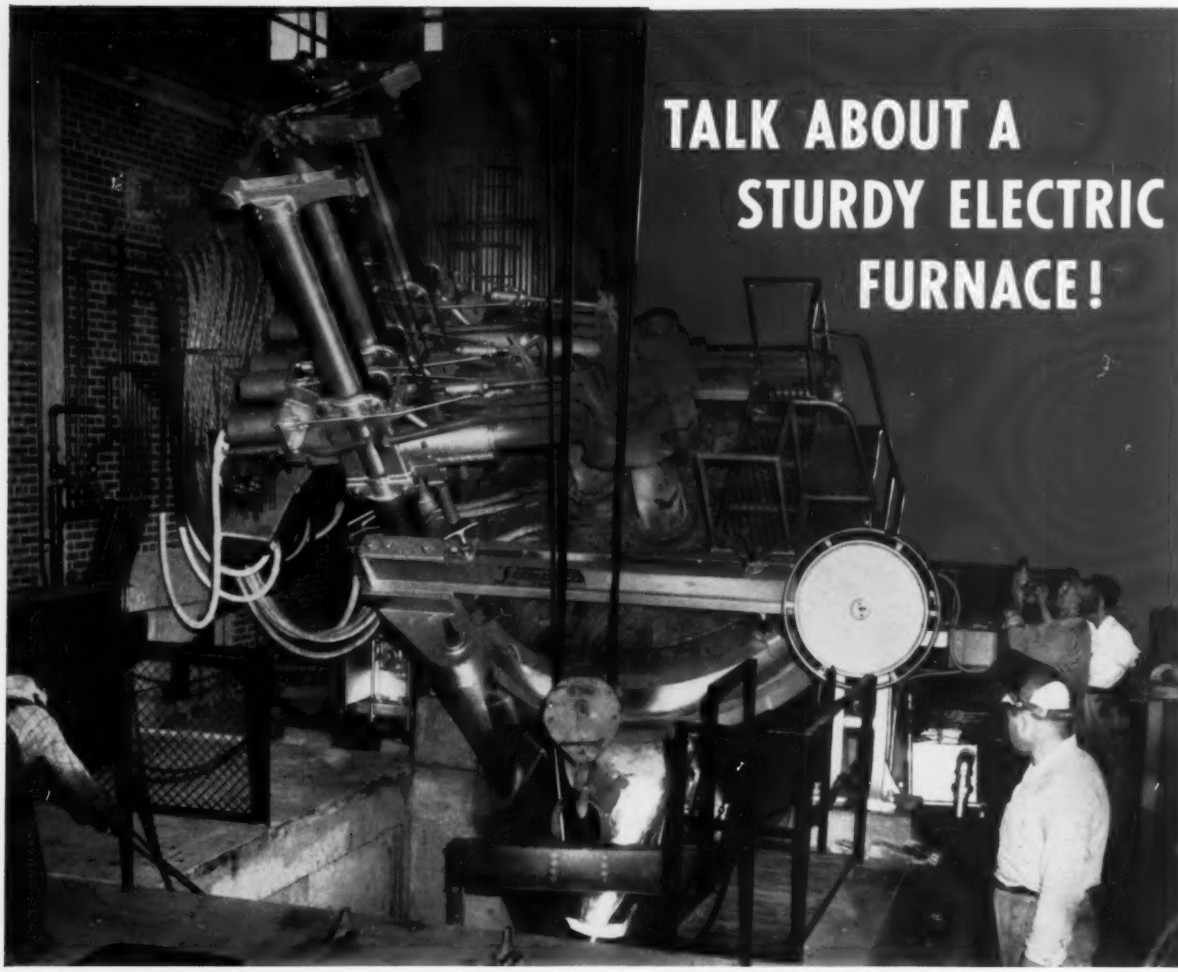
The Foundrymen's *Own* *Magazine*

American Foundryman

AUGUST

1954



"Our old Lectromelt takes the power overload of an oversize transformer without a sign of strain to the furnace or its parts."—Duncan Foundry, Alton, Illinois

Look at the record of Duncan Foundry's durable Lectromelt*

In October 1952, this test was made on their 1½-ton per hour Lectromelt: The furnace operated steadily for 27 days, 24 hours per day, using an oversize, 2000-kva transformer. 578 heats were tapped for an average of 21.4 heats per day. Average charge per heat was 6688 lbs. Time from power-on to tap averaged 58.5 minutes per heat. Time from tap to power-on for next heat averaged 8.8 minutes. Average power consumption per ton of metal was 501 kwh.

Duncan's oversize transformer keeps metal pouring fast, but throws a jolting overload of power into the furnace to do it. Still operating under this maximum stress, their sturdy Lectromelt turns out daily heats without a sign of extra strain or wear.

Expanding recently, Duncan Foundry added another, larger Lectromelt Furnace, confident of its quality and durability.

Look for your new electric in Lectromelt's Furnace line. Write for Bulletin No. 9, describing these versatile melting, smelting, refining and reduction furnaces. Write Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in...GERMANY: Friedrich Kocks GMBH, Dusseldorf...ENGLAND: Birlec, Ltd., Birmingham ... FRANCE: Stein et Roubaix, Paris... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege ... SPAIN: General Electrica Espanola, Bilbao ... ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF.

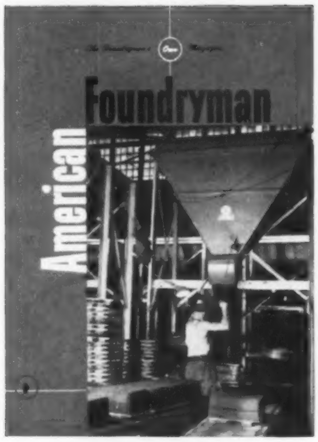
MOORE RAPID

WHEN YOU MELT... *Lectromelt*

American Foundryman

Volume 26 *August 1954* *Number 2*

Published by American Foundrymen's Society



At Northern Malleable Iron Co., St. Paul, Minn., roller-conveyor sections on casters are moved to end of molding floor by carry-out men who set molds down. Riddle suspended on pulley from slightly inclined bar moves away from molder as soon as he releases it.

In This Issue . . .

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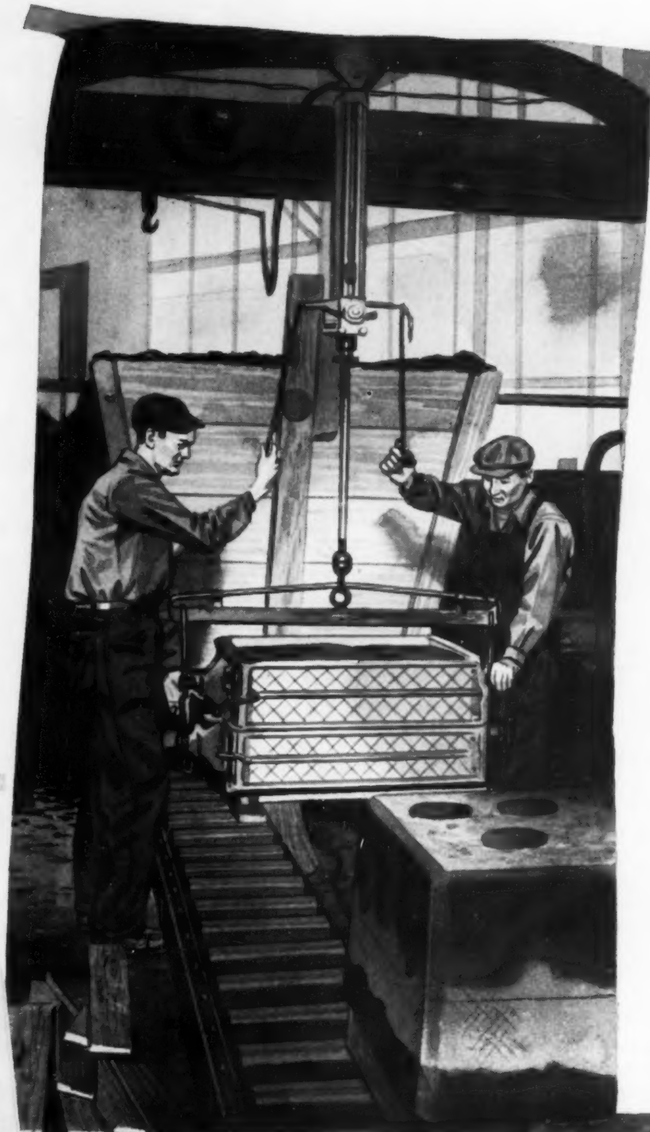
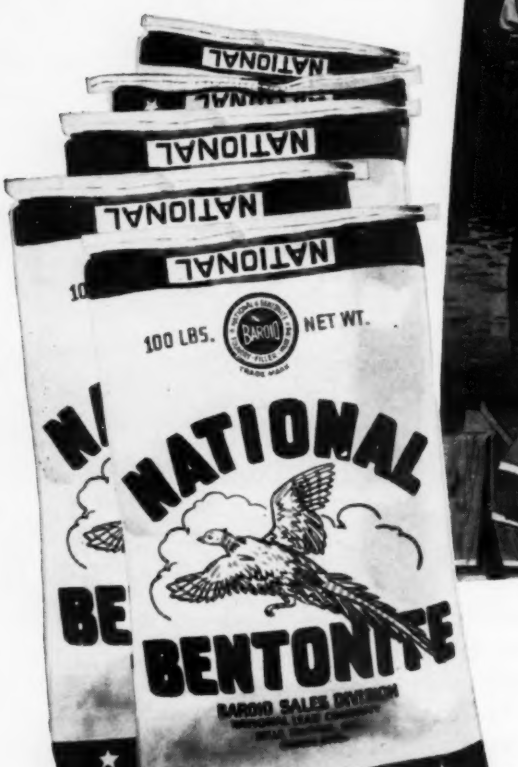
..be sure with a

NATIONAL BENTONITE

bond!





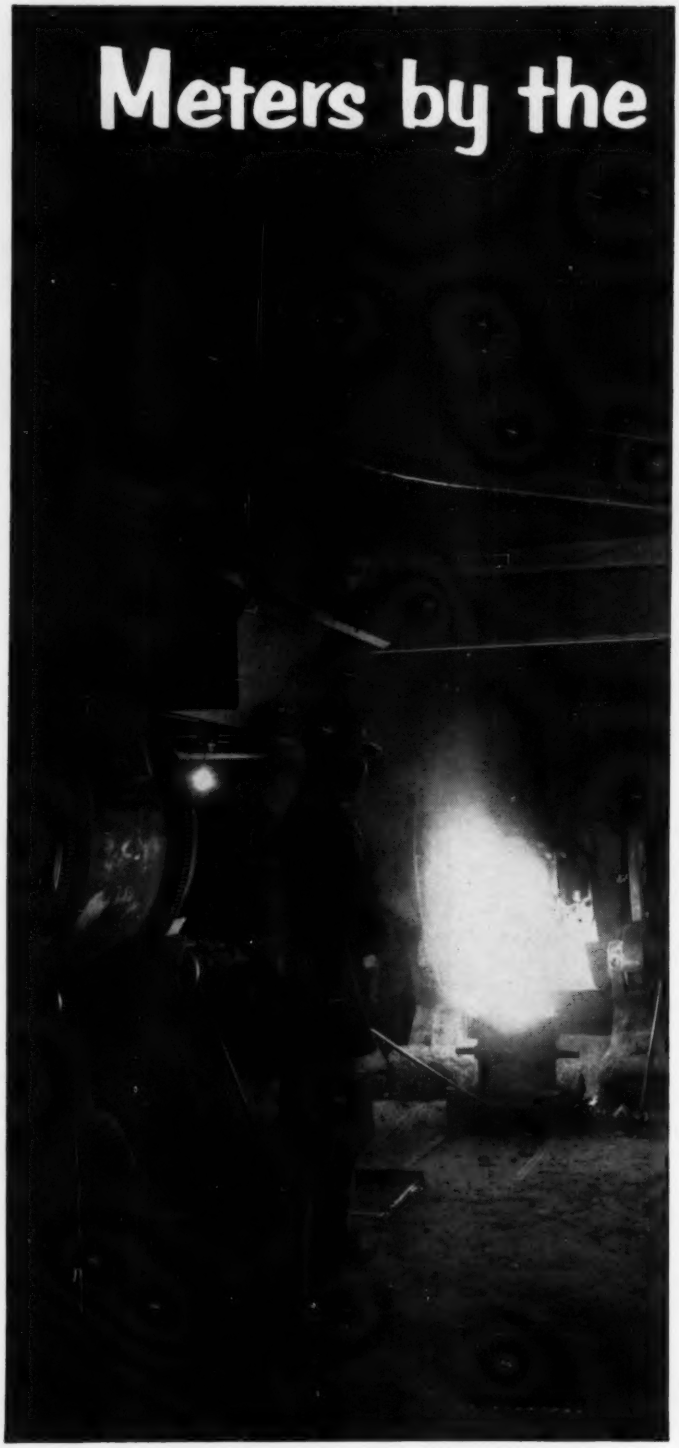
A dependable National Bentonite bonded mold means better production, better castings, less time in the cleaning room. Many experienced foundrymen have relied on National Bentonite for years because of consistently uniform high quality . . . good green strength . . . high hot strength . . . high sintering point . . . good mold durability . . . and because it requires the least water to temper correctly. You, too, can be sure of better bonds with NATIONAL BENTONITE. Quick service from better foundry suppliers everywhere.

Baroid

Baroid Sales Division ☆ National Lead Company

Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

Meters by the millions...



from metal melted by

6 DETROIT ROCKING ELECTRIC FURNACES

Recently, the 11,500,000th Neptune meter was produced. This, like the bronze-cased Neptune meters for 30 years, was made from metals melted in a Detroit Rocking Electric Furnace.

The six DEF Furnaces in Neptune Meter Company's foundry are under constant pressure to meet production demands which call for hundreds of tons of melt per month. To meet quality standards, melts must be uniform, of exact analysis, and produced with economy and speed.

The indirect arc and controlled rocking action of Detroit Furnaces bring important advantages to production of both non-ferrous and ferrous melts. To learn how these advantages can benefit *your* foundry operations, let our engineers analyze your melting requirements. Write today!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICH.

MEMBER FEMA FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC.

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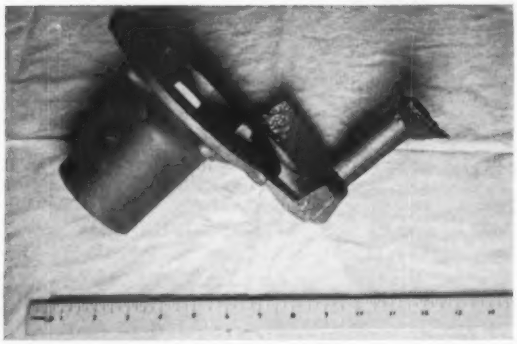
VOLCLAY BENTONITE
NEWS LETTER No. 16

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

Good Gating Helps!



Photos courtesy of: Harold L. Ullrich

The two photographs illustrate what can be accomplished by correct gating.

This gray iron casting is made in the drag. The sprue (down-gate) and the runner are in the cope. Notice the in-gates are in the drag with the casting.

The runner offers a perfect trap. Notice how the in-gates are necked-down to properly choke the in-rushing metal.

This News Letter is not intended to specify the proper gating method, or the proper riser to select for a specific casting, however, this is a case of a good gating practice to prove a point.

Silica sand was poured into this sprue at the same time metal was poured into the sprue to observe whether such a gate would trap contamination, sand, slag, etc.

Notice the gates after they were knocked from the casting. It can be witnessed they were literally filled with sand but the casting was quite clean without a single inclusion upon machining.

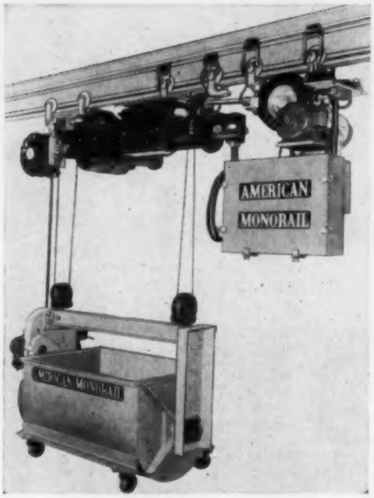
Such gates tend to eliminate machine shop scrap and do a complete job where sand mixtures may fail in trying to prevent a gate from cutting or washing into the casting.

Whirl gates are becoming very popular for similar reasons and are strongly encouraged and endorsed.

Gray iron castings are too difficult to reclaim when there is a slag inclusion, a contamination inclusion, or a sand inclusion. The casting generally ends by being deposited into the cupola for remelting.

Avoid such scrap losses by employing correct gating and remember that sand and slag cannot float on top of metal unless the gates are properly filled with metal. Use positive pressure gating, not a negative pressure gating system.

Products and Processes



Automatic Carrier

New automatic carrier with roll-over bucket for intermittent transfer of bulk materials between a single loading point and any number of discharge stations has been manufactured. It consists of a standard twin-hook electric hoist for raising and lowering the special bucket, equipped with casters, for manual positioning on the floor. Bucket is mounted within a rigid frame with one end geared to an electric motor which turns the bucket one complete revolution at the discharge point. Electric controls for automatic dispatch station selection as well as manual operation are also carried on the unit. *American MonoRail Co.*

For more data, circle No. 398 on p. 17

Tractor-Shovels

Torque-converter-driven "Payloader" tractor-shovel, Model HRC, a 4-wheel-drive unit with bucket capacity of 1 cy struck-load and $1\frac{1}{3}$ cy payload (heaped), has been announced. New model is available with either gas or diesel engine and is equipped with power-steering for ease of operation and maneuverability. Another feature, according to the manufacturer, is the heavy-duty full-reversing transmission which provides four speed ranges in either direction. *Frank G. Hough Co.*

For more data, circle No. 399 on p. 17

Belt-Polishing Unit

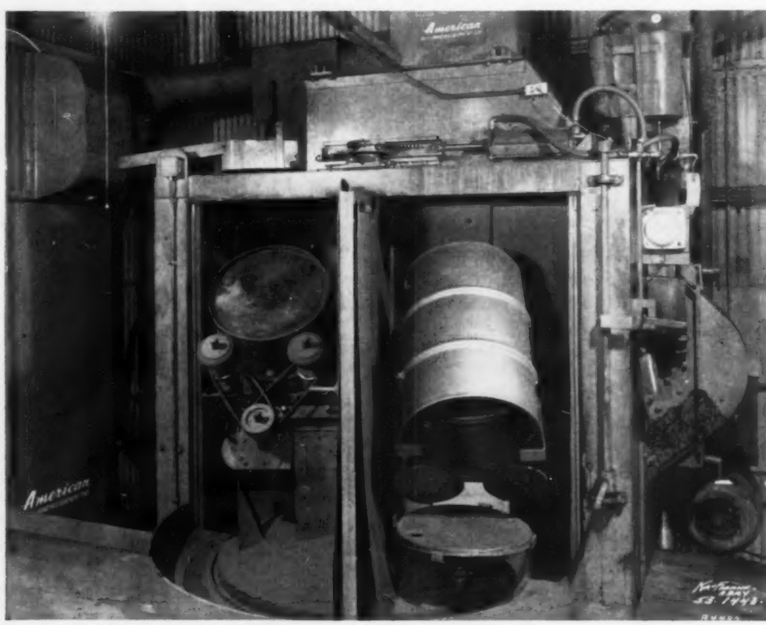
Belt polishing machine with contact wheel, idler wheel and drive motor all mounted on a single base and called the Bader Space Saver, occupies a minimum amount of space, eliminates tracking problems and reduces the need for adjustments during operation. Working area freedom permits the polishing of awkward and irregular work pieces. New machine uses a standard 132 in. belt length with a variety of contact wheel sizes. Wheel diameters from 4 to 18 in. can be used without changing surface speeds or belt size. By mounting all movable parts on a one-piece, balanced base, operator can easily and swiftly change working stance from a sitting to a standing position. *Stephen Bader & Co.*

For more data, circle No. 400 on p. 17

Side Shields

Eye Savers "Clip-On" Side Shields add deep cup side protection to safety spectacles of any size or shape. Molded of clear or green acetate, sides are easy to attach and remove. They fit practically any safety spectacle frame. If prescription safety spectacles are worn outside the shop, side shields can be removed quickly at the end of each day. *Watchemoket Optical Co.*

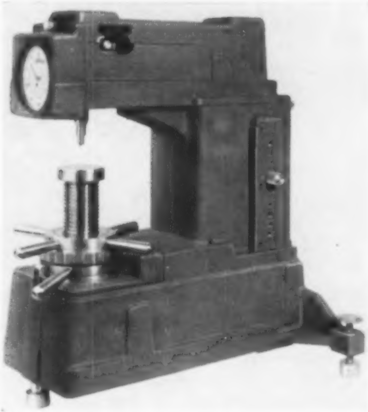
For more data, circle No. 401 on p. 17



Drum Cleaning Machine

New airless abrasive blasting machine for the reconditioning cleaning of 30 and 55 gal steel drums before painting and coating operations is announced. Unit is capable of cleaning the exterior surfaces of closed-end drums and both the exterior and interior surfaces of open-end drums, together with the lids. Machine is equipped with a hydraulically-rotated table with a partition that divides the machine into two compartments or work stations. Each work station consists of two power driven spinner shafts that rotate one drum in the blast zone. Each station also has a fixture for holding the lids in the blast. This arrangement permits one station to be loaded and unloaded while the other is in the blast zone. *American Wheelabrator & Equipment Corp.*

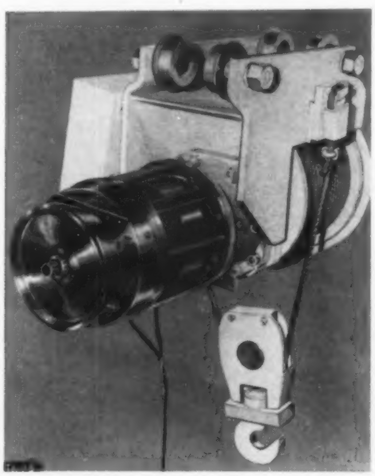
For more data, circle No. 402 on p. 17



Hardness Test Machine

An instrument that can make both regular and superficial Rockwell hardness tests has been developed and manufactured. In its dual function, the Kentrall Hardness Tester makes all regular Rockwell tests (60, 100 and 150 kg loads) and superficial tests (15, 30 and 45 kg loads) with any suitable standard "C", "N" or Ball type indenter. All results show on a direct, easy-reading dial gauge with a single numerical scale. Minor and major loads are applied by dead weights, not springs. *Torsion Balance Co.*

For more data, circle No. 403 on p. 17



Electric Hoist

New LeTourneau Electric Hoists like the one pictured above are made in capacities ranging upward from four tons. The near end of the motor shows the exterior of the bimetallic, cone-type brake, which is released automatically when hoist is started in either direction. Gear reduction is located between the motor and cable drum. Hoists may be suspended by lug, hook, plain trolley or geared trolley. *R. G. LeTourneau, Inc.*

For more data, circle No. 404 on p. 17

Fixed Abrasive Stone

Fixed Abrasive Lapping and Polishing Stone, manufactured by Scientific Abrasives, is claimed to be one of the most necessary and versatile tools. Parts may be lapped on this stone immediately after surface grinding or fine machine finishing and will attain 2 Micro-inch finish quickly on hardened steels as well as on soft metals, alloys and carbons. Stock removed will not load the stone. but is easily wiped away with an oil wetted cloth. *Abrasive Engineers.*

For more data, circle No. 405 on p. 17

Crucible Lining

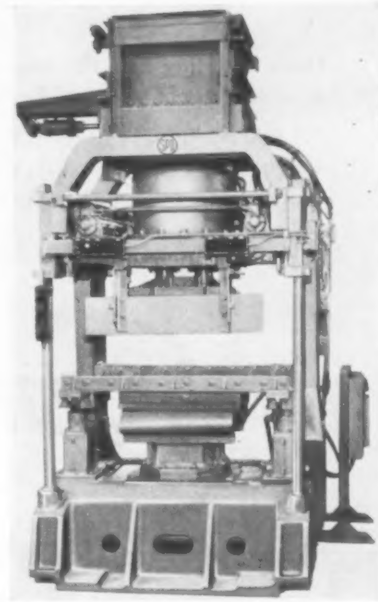
An improved crucible lining of white alumina has been developed for melting high nickel-iron alloys. Lined crucibles are important during some melting processes to guard against possible chemical reaction and resultant metal contamination. One of the major features of the lining is its ability to take a better glaze and improve bond strength. Even cast iron may be successfully melted in an alumina lined crucible, it is pointed out. *Electro Refractories & Abrasives Corp.*

For more data, circle No. 406 on p. 17

New Filter

A new filter has been developed which protects industrial and laboratory workers against air-borne particles including the hard-to-handle 0.3 micron size. Efficiency is assured in individual filters by testing each one on a specially built testing device at the factory. Known as the Super Micro-Toxison Respirator, it removes airborne radioactive matter and other toxic dust, mist and fumes. Effective filtering area of 45 sq. in. is contained in a compact unit which does not interfere with the wearer's vision. *American Optical Co.*

For more data, circle No. 407 on p. 17



Molding Machine

Development and production of the new Model No. 2302 semi-automatic jolt squeeze strip roll-on roll-off molding machine has been announced. Machine features overhead squeeze cylinder, sand metering device, simplified electrical controls and the patented SPO "inverted jolt" mechanism. All operations are automatically controlled by means of push-button actuated solenoid valves. Jolting action is timer-controlled, and the squeeze

continued on page 17

Here's How Marion Malleable Iron Works, Marion, Ind., uses Plaskon 580-11L liquid alkyd plastic resin for bond in cores. Produced by Barrett Div., Allied Chemical & Dye Corp., Plaskon is reported to produce cores with superior collapsibility, low binder requirement, high transverse and tensile strength, wide tolerance for moisture in the core mix, minimum sag and low gas evolution. Bentonite does not influence resin consumption, baking time is cut in half, oven temperature control is less critical, finer sands may be used, and dermatitis and objectionable odors are not encountered according to the users. *Barrett Div., Allied Chemical & Dye Corp.*

For more data, circle No. 408 on p. 17

HOW TO PUT THE SQUEEZE ON BLAST CLEANING COSTS

*. . . **USE MALLEABRASIVE, SHOT OR GRIT.*** Scientifically heat-treated for durability, Malleabrasive lasts longer. Laboratory controlled for strength and consistency, Malleabrasive cleans better faster. And because it does a better job in less time with fewer refills, Malleabrasive cleans *cheaper!* See for yourself. Next time you order blast cleaning abrasive, specify Malleabrasive from Pangborn Corp., 1300 Pangborn Blvd., Hagerstown, Maryland.

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PANGBORN'S 50th ANNIVERSARY—1904-1954

U. S. Patent # 2184926
(other patents pending)

Free Foundry Information

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Plaster Molds

Booklet, *"The Production of Plaster Molds for the Gravity and Pressure Casting of Aluminum Alloys using Foseco Pattrit Casting Plasters,"* is now available. Included are types of plaster molds; some of the advantages, and the preparation of solid plaster molds. *Foundry Services, Inc.*

For more data, circle No. 416 on card

Blast Cleaning

Bulletin No. 1210 is a condensed catalog of the entire line of equipment and accessories offered by Pangborn Corp. Booklet has been provided with a special index which simplifies its use. All equipment and accessories are listed by equipment, by type, and by purpose. Special features of the bulletin are descriptions of: the latest models of Rotoblast wheels; descaling machine for sheets and plates, a self-cleaning dust collector; and the new EV-2 Hydro-Finish cabinet. *Pangborn Corp.*

For more data, circle No. 417 on card

Flowability Test

Pocket Flowability Test, 4-page pamphlet, explains whether a sand will ram readily against all surfaces of a pattern. Literature gives diagrams and describes equipment necessary to conduct the test. Flowability is expressed as percentage calculated from hardness measurements at two points. *Archer-Daniels-Midland Co.*

For more data, circle No. 418 on card

pH Meters

Bulletin 300 illustrates and describes many models of pH meters, visible range and ultraviolet visible range spectrophotometers, infrared spectrophotometers, and other special instruments. *Beckman Instruments, Inc.*

For more data, circle No. 419 on card

Foundry Maintenance

Booklet describes the three perishable parts in most mulling or mixing equipment. Lists them as plows, tires and bottom plates directly under the area covered by the tires. Suggests that the hardsurfacing of these wear points extends the service life of the units. *Coast Metals, Inc.*

For more data, circle No. 420 on card

Bonded Sands

Bulletin No. 101 describes the foundry laboratory service available, explains the foundry sand grain classification, shows colored micrographs of various grades of sand and illustrates some of the various operations of the company. *Whitehead Brothers Co.*

For more data, circle No. 421 on card

Safety Equipment

Several pamphlets describing Gardwell safety equipment include descriptions of asbestos gloves, asbestos mittens, sleeves and aprons, frank leggings, sand blast helmets, and duck pants guards. *Safety Clothing and Equipment Co.*

For more data, circle No. 422 on card

Mold Machines

New 16-page bulletin illustrating and describing the Beardsley & Piper Champion line of mold and core machines has just been released. Bulletin includes complete data, dimensional drawings, and installation and operational photographs. Many of the machines covered are completely new and others have been fully redesigned and modernized. Data on each machine is complete so that the bulletin will serve as reference in planning machine installations. *Dept. AF, Beardsley & Piper Div., Pettibone Mulliken Corp.*

For more data, circle No. 423 on card

Single Girder Cranes

Bulletin MD-848 illustrates applications, outline dimensions and construction details of Industrial single girder motor driven cranes. Catalog also illustrates many crane accessories including the manual and mechanical sheet lifter, plate grab, crane and hoist scale and equalizer level lift. *Industrial Crane & Hoist Corp.*

For more data, circle No. 424 on card

Pattern Buyers Guide

Pattern Buyers Guide is designed as an aid to those faced with the problems of purchasing adequate pattern equipment as a phase of product design or production engineering. Cover of pocket-size

continued on page 20

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434	435	436			

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Products & Processes

Continued from page 11

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is regulated by a pressure switch. Manual pushbuttons for control of each operation are included in the control panel. Unit has a squeeze capacity of 57,000 lb and jolt capacity of 4000 lb on standard 80 psi line pressure. Pattern draw is 12 in. jolt cylinder diameter 12 in. and squeeze cylinder diameter 30 in. Free air consumption per cycle is approximately 96 cf. Flasks ranging from 22¼ to 37½ in. in width can be utilized. *SPO, Inc.*

For more data, circle No. 409 on card

Wear-Resistant Liners

Wear-Resistant Liners for better protection of parts subject to abrasive action have been introduced by Pangborn Corp. The alloys in the liners with special heat treatment are almost diamond hard. This plus a polished surface gives extraordinary wear resistance. Tests of this new hard alloy indicate that it is a real solution to the problem inherent in the blast cleaning process—rapid wear induced by the abrasive stream on any exposed parts. The perfectly smooth, hard surface is not only wear resistant but reduces shot turbulence, minimizes shot breakdown from striking the plates, and maintains a constant deflection pattern. *Pangborn Corp.*

For more data, circle No. 410 on card

White Glue

New white glue for use in pattern shops and general commercial applications has been announced. Known as Master White Glue, it is said to embody exceptionally high standards of performance, stability, and long life. Thoroughly proven in extensive laboratory and shop tests, product has an extremely high solid content that delivers the utmost in adhesive qualities and ease of use. It remains stable even when stored for long periods of time and is not affected by freezing. *Kindt-Collins Co.*

For more data, circle No. 411 on card

Welding Rod

Coast Metals No. 170 is a thin-walled tube electrode, containing molybdenum, boron and iron. On steel it produces deposits that are extremely hard and homogenous, with high resistance to abrasion and impact. Some typical suggested applications for use of the rod are: muller tires, plows and plates, pug mill paddles, mixer plows, screw flight conveyors and elevator buckets. *Coast Metals, Inc.*

For more data, circle No. 412 on card

Plastic Metal

New putty-like material consisting of fine steel powders and a strong plastic has been developed called Devcon. Easy to use, no heat or pressure is required. After desired shape has been formed, Devcon becomes a strong, tough and rigid metallic piece in approximately two hours. It makes a precision form of the original without distortion or shrinkage and can be sawed, drilled, tapped, threaded and ground with conventional metal-working equipment. *Chemical Development Corp.*

For more data, circle No. 413 on card

Aluminum Compound

New aluminum compound has been developed which can be used for repairing castings, filling joints in sheet metal and building up surfaces of patterns, molds and dies. Known as Metalset (A101), it is an epoxy resin compound, hardens by polymerization following the addition of a curing agent, and not through evaporation of a solvent. This means that it can be applied in any thickness without cracking and with negligible shrinkage. *Smooth-On Manufacturing Co.*

For more data, circle No. 414 on card

Visor Goggles

Eye protection for industrial workers against flying particles and chemical splashes, and against light glare is offered in the new MSA-Jones Visor Goggles. Design features are an opaque green visor, either perforated for open-type ventilation or two-port screened, for indirect ventilation; and readily interchangeable curved, one-piece lenses of clear, light green, medium green or dark green impact-resistant plastic. *Mine Safety Appliances Co.*

For more data, circle No. 415 on card

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Free Information

continued from page 18

guide contains a slide chart which shows pattern recommendations by casting quantity requirements. Book contains a complete glossary of terms and is profusely illustrated. A brief description is given of the features found in the following equipment: cast iron patterns, brass patterns, permanent molds, aluminum patterns and matchplates, and many others. Also discussed are the lost wax and frozen mercury process dies, shell molding patterns and others. *Dept. AF, Master Pattern and Mold Co.*

For more data, circle No. 425 on p. 18

Hydrogen in Steel

Murex, Ltd. Review, Vol. 1, No. 13, published by Murex, Ltd., deals with a paper on *"The Significance of Hydrogen in Steel Manufacture,"* by K. C. Barraclough, Brown-Firth Research Laboratories. Booklet covers: determination of hydrogen in steel; sampling of liquid steel for the determination of hydrogen; effect of hydrogen on the solidification of liquid steel, and effects of hydrogen on solid steel. *Murex, Ltd.*

For more data, circle No. 426 on p. 18

Core and Mold Wash

Booklet describing Mexican Core and Mold Washes for ferrous and non-ferrous foundry practice is now available. A complete description of each of eight washes is given and an explanation of the particular uses for which each is best suited. A brief explanation of the production processes employed in the manufacture of the Mexican Core and Mold Washes is included. Booklet also announces the new color-coded bags that have been adopted for packaging the Mexican Graphite washes. *United States Graphite Co.*

For more data, circle No. 427 on p. 18

Foundry Equipment

Catalog P-152 illustrates the construction features and operating advantages of Modern pouring devices, ladles, cranes and mono-rail systems. Eighteen types of ladles, as indexed on page 2 of the new catalog, are grouped by series numbers, diameters and metal capacities to simplify the process of matching metal loads to the gross lifting capacities of the handling equipment. *Modern Equipment Co.*

For more data, circle No. 428 on p. 18

Coated Abrasives

New booklet describing the use of coated abrasives for grinding and finishing nonferrous metals is now available. Brochure shows before-and-after pictures of aluminum, brass, bronze, manganese bronze and magnesium products on which coated abrasive belts or discs were used. It also describes specific grinding operations in non-ferrous foundries. Another feature of the publication shows the use of coated abrasives in the finishing of patterns, molds and dies; and the use of pressure sensitive tapes in non-ferrous foundries. *Minnesota Mining and Manufacturing Co.*

For more data, circle No. 429 on p. 18

Refractory Mold Binder

Booklet F-8265 describes the preparation of hardenable refractory mixtures using ethyl silicate and the factors that affect their successful use. Controlled procedures necessary for the successful preparation of the refractory mixture or investment are described with the aid of charts and representative formulations. *Carbide and Carbon Chemicals Co.*

For more data, circle No. 430 on p. 18

Equipment Catalog

Foundry Equipment Catalog No. 66 illustrates and describes standard, heavy-duty, and stack-molding flasks. Flask bars, clamps and clamping bars and pins are also covered in the brochure. Booklet also includes standard and heavy-duty flask symbols. Specifications for wheelbarrows, carts and trucks are given. *Sterling Wheelbarrow Co.*

For more data, circle No. 431 on p. 18

Arc Welding

Catalog, ADC 709B, features the Heliwelding process and the equipment used with it. Describes and illustrates in actual welding operation, the manual holders, either air or water-cooled, light or heavy duty water cooled machine holders for semi-automatic equipment and the automatic head that can be used with the Heliweld process. Automatic hardfacing process using vibratory feeder is also shown. Booklet tells how each piece operates, which type of work it is best suited to, and why it is the choice for a specific job. Heliwelding is Airco's tungsten arc welding process which uses an inert-gas shield of helium or argon or both to protect the weld from contamination by the atmosphere. *Air Reduction Sales Co., Div., Air Reduction Co.*

For more data, circle No. 432 on p. 18

Continuous-Cast Process

New 6-page bulletin describes the patented Asarco Continuous-Cast process by which a variety of bronze alloys is cast into rods, tubes and shapes of many different diameters and profiles. According to the booklet, process exclusively produces as mill products a large group of copper-base alloys which were formerly available as foundry castings only. *American Smelting and Refining Co.*

For more data, circle No. 433 on p. 18

Hot-Metal Magic

Booklet F-8369, *"Hot-Metal Magic,"* gives a glimpse of some of the romance and excitement of the alloy-making industry, and tells about everyday miracles that alloys are performing. It presents a brief, non-technical picture of alloys. *Technical Service and Development Dept. of Electro Metallurgical Co., Div. Union Carbide and Carbon Corp.*

For more data, circle No. 434 on p. 18

Alloy Castings

Bulletin A-141, Heat Resistant and Corrosion Resistant Alloy Castings in Industry, covers typical compositions regularly produced of stainless and heat-resistant alloys in cast form, with their applications, limitations and the types of service for which they are suitable. Over 175 photos illustrate applications of typical alloys by industry. Charts compare creep strength of various alloys, resistance to corrosion in certain media, and to oxidation at elevated temperatures. *International Nickel Co.*

For more data, circle No. 435 on p. 18

Safety Award to AMERICAN FOUNDRYMAN

Wm. W. Maloney, secretary-treasurer and general manager of AFS, right, accepting one of the National Safety Council's Public Interest Awards for 1953, on behalf of AMERICAN FOUNDRYMAN from Ned H. Dearborn, president, National Safety Council. The awards are presented annually to magazines, newspapers, radio and TV stations and networks, advertisers, and outdoor advertising companies for exceptional service to safety.


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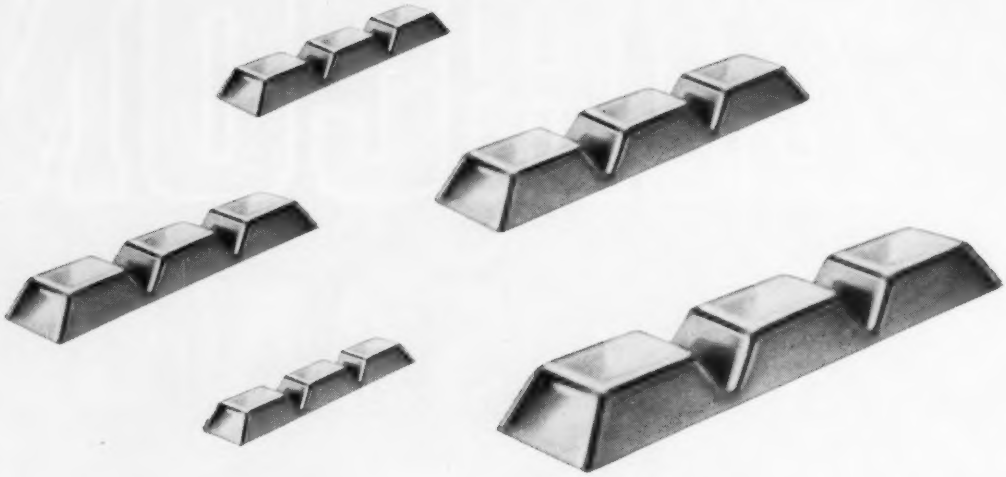

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Letters to the Editor

All letters of broad interest which do not violate AFS policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Agitation and Magnesium

Just received the April issue of AMERICAN FOUNDRYMAN and have been busy reading the several papers that will be presented at the coming Convention. These are most interesting and I can assure you I appreciate the fact it keeps me up to date on developments back home, so I can intelligently do the job I am over here to do.

Of course, there are many statements made by some authors that naturally I feel I can take exceptions to, just as other foundrymen do, because of experiences they have had in a lifetime in this interesting business.

The article written on gating and risering of magnesium is very interesting, and although I have had very little experience with this metal, it is my understanding that it should be poured with as little agitation as possible, the same as aluminum and bronze. Fig. 3 of this article (*Gating and Risering of Magnesium*, by H. E. Elliott; in two parts, April and May, 1954, AMERICAN FOUNDRYMAN) shows four different suggestions or methods of pouring a certain casting. To me, the drawing (B) would do the most satisfactory work with the least agitation. Pouring down grade, as at (D) is poor practice in any metal, and usually shows lines of the path the metal has taken from the gates to reach the lowest part of the mold, and many times there is a cold shut along the path the metal has passed.

Less Chance of Cold Shuts

I know from experience cast iron or steel poured up hill in thin castings will produce better castings and there will be less chance of cold shuts as the metal progressively fills the mold at an even keel.

In Fig. 4, I cannot see why the two small lugs should be placed in the cope; however, if for some reason not explained in the paper, these had to be in the cope, why not use a small whistler on each lug to let out any gas that is trapped there, as I believe a misrun of these lugs is due to entrapped gas rather than cold metal.

There is much written about gating systems, but seldom if ever does one read how to figure the main gate, the ingates, and the down sprue, which should be large enough to feed the number of ingates and the main gate in the same proportionate size; that is, to supply metal to each of the ingates at the same time.

To prevent an effect of squirting or of a hose, this ingate should be designed to control the flow from the main gate and as it joins the casting, it should be wider and thinner or larger in cross section than at the point where you are controlling the rate of flow. All these gates and runners should be adequately filleted, especially where the gate joins the casting. For two reasons: (1) The sand will not crumble or dry out too fast; (2) When the metal runs in through this gate it will not arode these filleted corners as it will when the corners are sharp edges and, therefore, there will be less dirt washed into the mold cavity.

JOSEPH PRENDERGAST
Foundry Specialist
U.S. Operations Mission
to Italy

Elliott Replies

I'd like to thank Mr. Prendergast for his interest in my article on gating and risering and for his comments.

In his reference to Fig. 3 and his discussion of it, he emphasizes the value of filling the mold by up-hill flow, and avoiding pouring down grade. This is exactly the point that was intended to be conveyed by Fig. 3 and I regret that somehow the point apparently wasn't clear. Items (B), (C), and (D) are all intended to result in up-hill flow. In diagram (D), the metal is introduced into the ring runner at the right, the casting fills from right to left, and the degree of tilt is sufficient so that the right hand wall will not slope down hill.

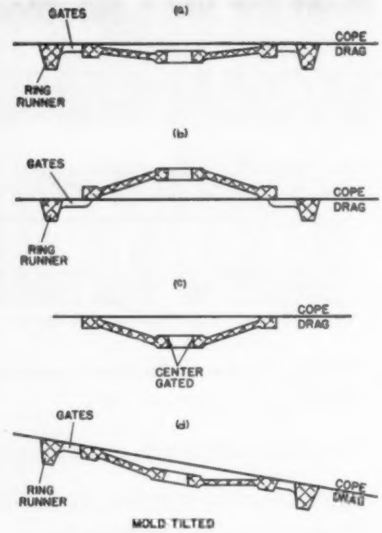

Fig. 3 — Flow lines may develop in central part of casting gated as in a. To avoid, use b, c, or d.

Generalized Problem

Figure 4 is not intended as a recommendation as to how to cast a specific part, but merely as a generalized problem that will, from time to time, confront the foundryman. When there are lugs that must be cast in the cope, they are hard to fill if another large cavity is taking the supply of metal at the same interval of the pour. Even venting is often found to be inadequate to overcome this difficulty.

Incidentally, lugs like those shown in Fig. 4 can give trouble when cast in the drag. The metal dropping in from above may fail to displace completely the air in these cavities, resulting in entrapped air bubbles.

Mr. Prendergast's preferences as to the location of the choke in the gating system are interesting and his experience certainly entitles him to his own views as to what works best. We like to control the flow rate at the sprue, but recognize that there are other successful approaches. I am very much in agreement with his comments regarding generous fillets for junctions of gates and runners.

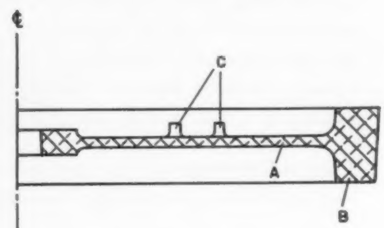

Fig. 4—Bosses at C may misrun from heavy demand for metal at B, causing unusually slow rise of metal at A.

Erosion of the sand by metal is not so severe a problem with magnesium as with many metals, but it is still good practice to avoid sharp corners of sand estanding into the metal stream unnecessarily.

H. E. ELLIOTT
Asst. Foundry Superintendent
Dow Chemical Co.
Bay City, Mich.

Liked Work Simplification Article

This letter is with reference to the excellent article, *"Work Simplification,"* by W. S. Williams, pages 54-57, in the February issue. May I please receive two tear copies.

NORMAN W. SCHERER
Office Manager
Klotz Machine Co.
Sandusky, Ohio

Materials Handling List

The Office of Technical Service, U.S. Dept. of Commerce, has published a *Bibliography on Materials Handling,* containing some 270 references. Send 50 cents to Room 6227, Commerce Building, Washington 25, D.C. Refer to Report PB 111306.

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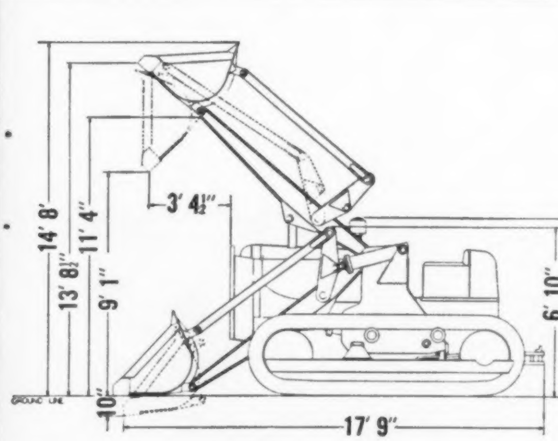

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Foundrymen in the News

R. L. Wilson . . . vice-president

R. B. Pogue . . . consulting engineer

E. B. Smith . . . assistant manager

Brake Shoe & Castings Div., American Brake Shoe Co. has appointed **R. L. Wilson** vice-president in charge of engineering, and **R. B. Pogue** as consulting engineer. **W. N. Hulme** has been named district sales manager of brake shoes, and **J. L. Goheen** district sales manager of castings. Both men will be located at San Francisco.

R. W. Kerr, formerly deputy group executive, American Machine & Foundry Co.'s general products group, has been named a divisional vice-president and group executive. **Col. H. A. Quinn,** U.S.A. (Ret.), has been named manager of the AMF general engineering laboratories, succeeding **R. A. Kimes,** who becomes director of engineering of the AMF electronics division.

George B. Coale succeeds **George L. Ratcliffe** as general manager of the Baroid Sales Div., National Lead Co. A 1927 graduate of the U.S. naval academy, he joined National Lead Co. in 1935. Mr. Ratcliffe, a vice-president of National, will remain active in the division.

R. B. Strong, for 45 years an official of the Homer Foundry Co., Coldwater, Mich., recently retired from active service with the firm, although retaining a financial interest in the firm. He has traveled for the organization in every section of the United States, primarily in a sales capacity.

H. S. Wingate, vice-president and director, was elected president of International Nickel Co. of Canada, Ltd. He was also elected to membership on the company's executive committee and to the presidency of the U. S. subsidiary, International Nickel Co., Inc. Mr. Wingate first became active with the company in 1930, joined it in 1935 as assistant secretary of the Canadian company.

John Taylor, formerly vice-president, Lester B. Knight & Associates, has joined Norris & Elliott, Inc., as vice-president. He will head their Chicago office, which he opened nine years ago. Previously with Norris & Elliott for 14 years, he organized their foundry division in 1940.

E. B. Smith has been promoted to assistant manager, machine division, Osborn Mfg. Co., Cleveland. Formerly sales engineer for the Ohio and West Virginia territory, Mr. Smith has been with Osborn for over 26 years.

Keokuk (Iowa) Electro-Metals Co. has announced several top-level appointments. **C. R. Sheaffer,** chairman of the board, W. A. Sheaffer Pen Co., has been re-appointed director of Keokuk. Other board appointees, increasing its membership to eight, are **E. H. Fries,** company vice-president, and **W. T. McGinnis,** assistant to the president. Mr. Sheaffer is a former member of the board, having resigned when President Eisenhower named him assistant secretary of commerce in Washington, D. C.

Lindberg Engineering Co., Chicago, has announced two appointments in its newly-formed Field-erected Equipment Division. **E. B. Jones** will be chief engineer in charge of estimating and engineering; and **C. P. Masure** will serve as purchasing agent.

Frank L. LaQue has been elected vice-president of International Nickel Co., Inc., and manager, Development and Research Div. He succeeds **T. H. Wickenden** in both positions. **O. B. J. Fraser** and **Donald J. Reese** will serve as assistant managers of the division.

continued on page 28

G. B. Coale . . . general manager

J. Taylor . . . leaves L. Knight

D. J. Reese . . . promoted

Foundrymen in the News

continued from page 26

M. Post . . . retires

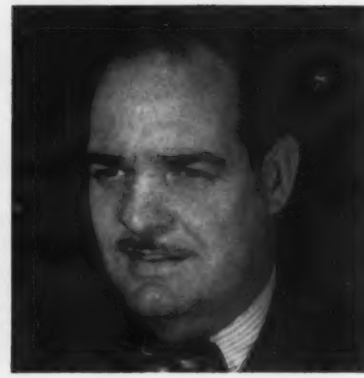
Marshall Post, 1938-39 President of American Foundrymen's Society, recently retired from his position as vice-president in charge of operations, Birdsboro (Pa.) Steel Foundry & Machine Co., culminating a 54-year career in the industry. He began his career as a molder's helper for American Steel Foundry Co. at Granite City, Ill., in 1900. After working for several companies, he joined Birdsboro in 1925 as works manager.

D. L. Shirley is now district sales manager for the Seattle, Wash., area of Link-Belt Company's operation. He will work out of the company's Seattle plant.

R. J. Gerry is a new sales engineer for Refractories Engineering & Supplies, Ltd., with headquarters at Toronto.

G. E. Miller has been appointed sales manager of the machine division, Federal Foundry Supply Co., Cleveland. Mr. Miller is a director of the AFS Northeastern Ohio Chapter and a member of the FEF advisory committee.

J. W. Schneider . . . named manager



H. C. Grant . . . moves up

John W. Schneider has been appointed manager, Dearborn Iron Foundry; and **Harold C. Grant** has been named to a similar post with Dearborn Specialty Foundry. Both plants are subsidiaries of Ford Motor Co., Dearborn, Mich.

H. R. Salisbury, president, Air Reduction Sales Co., subsidiary of Air Reduction Co., Inc., New York, will retire immediately, after having been with Airco since 1926. He will be succeeded by **J. H. Humberstone,** president, Ohio Chemical & Surgical Eqpt. div. of Airco, and also vice-president of the parent company.

R. W. Hackett has joined the sales staff of United States Graphite Co., Saginaw, Mich., and will represent the company in the tri-city area of Davenport, Iowa and Moline and Rock Island, Ill.

Samuel G. MacNeill is now associated with Charles C. Kawin Co., Chicago and Buffalo, N. Y., as metallurgical engineer. He will specialize in consulting work on induction melting of high alloy materials, such as high-temperature alloys, jet alloys, tool and stainless steels.

E. E. Pollard has resigned as plant manager, Alabama Pipe Co. water pipe plant, Anniston, Ala., and has become vice-president in charge of operations, Caldwell Foundry & Machine Co., Birmingham, Ala. Mr. Pollard is incoming chairman of the AFS Birmingham District Chapter.

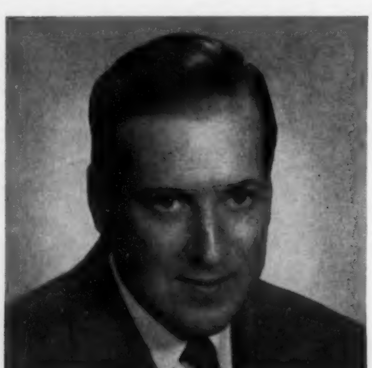
Dr. David I. Sinizer has joined the staff of the metallurgical research department, National Research Corp., Cambridge, Mass. He will serve as a project manager. His experience has been wide in both ferrous and non-ferrous physical and process metallurgy.

Earl Solomon, research engineer, Electro Refractories & Abrasives Corp., Buffalo, N. Y., has been appointed to the metallurgical technology advisory committee of the Erie County Technical Institute, Buffalo.

Two appointments have been announced by Vanadium Corp. of America, New York. **R. F. Hancock** is now assistant vice-president at New York; and **F. F. Franklin** becomes district manager of the Cleveland office.

Harold L. Barrick has been appointed assistant treasurer, and Vernon W. Sykes has been made assistant secretary of Federal Foundry Supply Co., Cleveland.

Harold L. Ullrich, formerly chairman, Metropolitan Chapter, AFS, and currently an AFS National Director, has opened offices as foundry manufacturers' representative in Livingston, N. J. Formerly works manager, Sacks Barlow Foundries, Inc., Newark, N. J., for 28 years, Mr. Ullrich will represent foundries producing both ferrous and non-ferrous castings and forgings.



G. E. Miller . . . sales manager

E. E. Pollard . . . joins Caldwell

H. L. Ullrich . . . opens offices

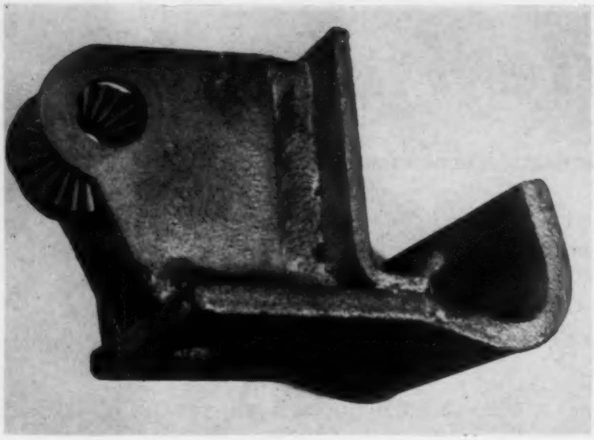
Talk of the Industry

ARRIVAL OF HOT WEATHER again brings up the question of salt tablets. Dr. L. E. Hamlin, medical director, American Brake Shoe Co., Chicago, recommends use of enteric-coated tablets, which do not dissolve in the stomach, thus cause no nausea. Foundry workers are likely to suffer from these types of reactions to excessive heat: Heat Cramps—Violent spasms of abdomen and limbs resulting from loss of chlorides and sugar by workmen who drink too much water and sweat excessively. Can be prevented by administration of sufficient amounts of salt and dextrose. Heat Exhaustion—Patient appears to suffer from shock, feels exhausted and tired, face becomes pale, pulse is rapid and weak because heat-regulating center of brain is embarrassed. Keep individual warm if temperature is sub-normal, and treat for shock. Heat or Sun Stroke—Heat-regulating mechanism of brain is paralyzed and temperature may rise very high. Treatment is opposite to heat exhaustion. Remove patient to cool atmosphere, sponge body with cool water until temperature is lowered gradually. (Note: Workers on salt-free diets should consult their physicians before using salt tablets.)

METALLURGICAL EXAMINATION of hot tears in steel castings, part of an AFS-sponsored research project, carried on at Armour Research Foundation, has thus far disclosed that all sections from hot tears areas contain products of oxidation and decarburization, as well as porosity. In the shrink areas, the adjacent matrix or core structures were abnormal. All structures in hot tear areas were indicative of either a fully or partially annealed condition. Transverse sections showed the fracture to progress in a trans-crystalline as well as an inter-granular manner. Work will continue, both at Armour and the several steel foundries that have been cooperating in the project.

ACCIDENTS IN THE FOUNDRY INDUSTRY were just as severe in 1953 as in the preceding year but the frequency of occurrence dropped 21 per cent, according to figures released by the National Safety Council. Frequency rate for 1953 was 10.94, a drop from 13.93 in 1952, while severity factor remained at 1.05 for both years. While these figures show an encouraging improvement, it must be cautioned that they are only for reporting members of the Council. Over-all statistics for the metals casting industry are roughly double. Foundry still is rated in the bottom third of American industry in both frequency and severity rates.

CONVERSIONS TO CASTINGS exceeded the changes from castings in 135 examples of cost reduction through materials selection shown in the May issue of Materials & Methods. There were 29 conversions but only 20 switches from castings to non-cast parts. In four other cases, the manufacturer changed casting process or casting alloy. Castings lost to, but also gained from forgings, weldments, powder metallurgy, plastics, and machining processes. In the switch to castings, heaviest gains were made in sand casting, with several conversions to die casting and one to shell molding. Several partially-cast composite assemblies were converted to all-cast parts.



Malleable casting (right), a converted trailer hitch weldment, saved 25 per cent for the customer in production cost and gave a better looking, stronger part. Compare with weldment pictured at left.

Modern Malleable Iron Production and Selling

HERBERT F. SCOBIE / *Editor*

"Selling and promotion" was the theme of George T. Boli, president of Northern Malleable Iron Co., St. Paul, Minn., during his just-completed term as president of the Malleable Founder's Society. Here's how he practices what he preaches and backs it up with a plant modernization program that provides a nice balance between maximum quality control and production with a minimum investment.

National Malleable President George Boli (left) discussing design of a conversion from weldment to malleable castings with sales engineer Don Fulton. (All photos by Al Becklund, pattern shop foreman.)

■ Northern Malleable Iron Co., is a long, narrow (902 x 120 ft) plant with spacious gangways, straight-line flown from raw materials to casting shipping dock, and ample light from its long southern exposure containing about half the plants 45,000 window lights. Castings are produced on a semi-production basis, about 50 per cent going to manufacturers of agricultural equipment, and all with an unusually good surface finish and close dimensional tolerances. The plant includes a pattern shop to insure that critical patterns and core boxes will be made exactly as desired for production efficiency.

Combining craftsmanship and engineering with aggressive salesmanship, Northern took in 65 new conversion jobs in 1953 and has already brought in over 40 more this year. The company's three sales engineers bring new work into the plant—they don't just wait for the orders to come by. Referred to as "junk men" because they're constantly bringing in parts for conversion to malleable castings, the salesmen prowl their customers' plants looking for jobs that can be done better in malleable. "Done better" may mean lower cost, superior mechanical properties, better appearance, or improved machinability.

The salesmen are well-grounded in engineering fundamentals and in plant practices and bring back not only prospective conversions but answers to ques-


(Left) Looking down main bay toward air furnace (cuts across gangway at middle) and finishing department at far end. (Right) East end of plant with shipping department in foreground and annealling pots and furnaces (center).

tions relating to permissible design changes. After visualizing the existing part as a casting and considering its processing in the customer's plant, the sales engineers change sections and add fillets, and finally themselves prepare engineering drawings of the redesigned part. Into the new design goes the combined experience of the salesman, the heads of the various production departments, and George T. Boli, company president, who spends more time in the plant than he does in his office.

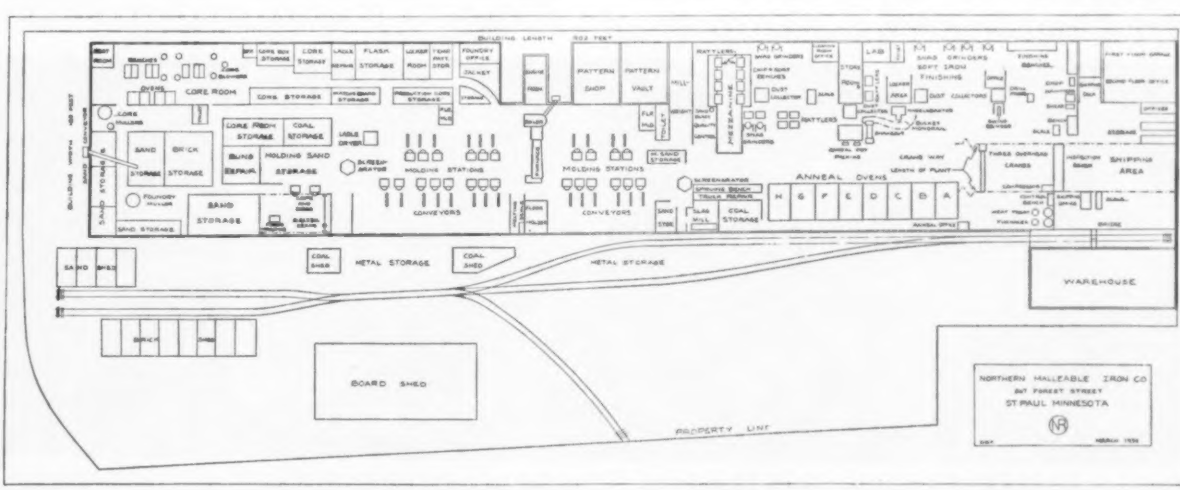
About 75 per cent of the company's output is Grade A malleable, the balance being pearlitic produced by quenching and tempering to desired mechanical properties. Average mechanical properties customarily produced are shown in Table 1. Average casting weight is 1¼ lb with the range running from 1/10 lb to over 200 lb. Section sizes run ⅛ in. to 3 in. and occasionally outside these figures. Most of the work

TABLE 1—AVERAGE MECHANICAL PROPERTIES OF NORTHERN MALLEABLE IRONS DURING 1953

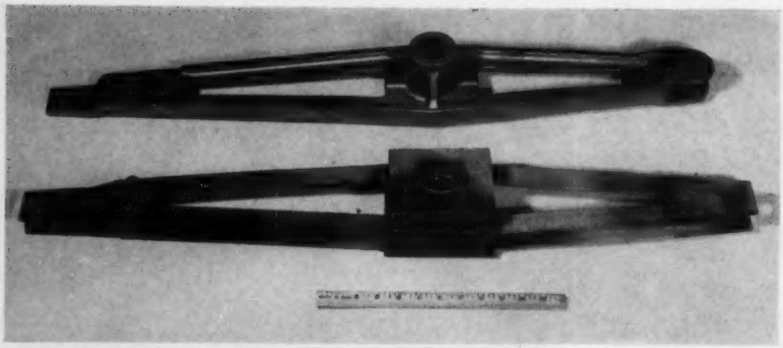
	Malleable Grade 35018	Pearlitic	
Tensile Strength, psi	56,577	69,000	88,900
Yield Strength, psi	39,283	49,000	66,500
Elongation, %	22.13	14.73	6.3
Brinell Hardness Number	135	160	185

is produced on squeezers. Some of the larger production work is turned out with cope and drag patterns on a jolt-squeeze and a jolt-pin lift machine. Occasionally two squeezer men team up to produce deep molds, one making the drag, the other the cope. One molder works on loose patterns, both bench and floor, and one makes sample castings from matchplates to round out a crew of 26 molders.

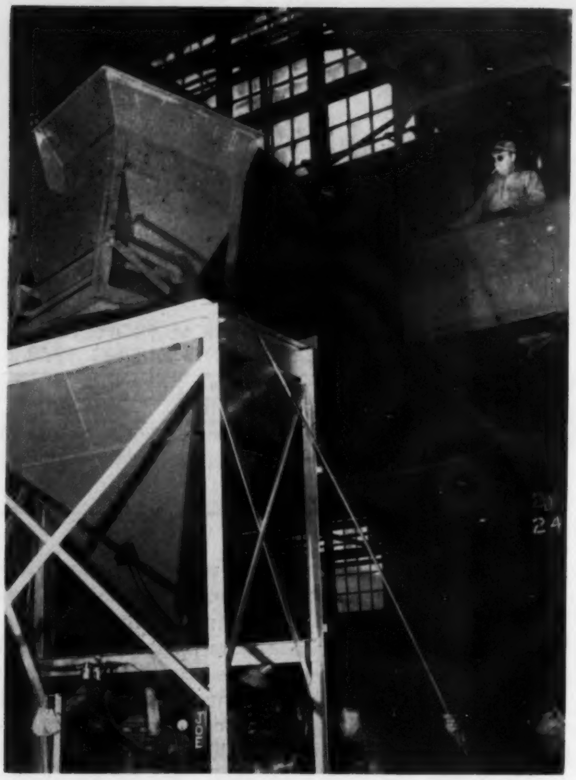
Originally, the molders worked from heaps, setting



Floor plan of Northern Malleable Iron Co. foundry.



Oscillating arm for harvester converted from weldment to malleable saved money, looks better, and requires less adjustment of cutter bar because casting is more rigid.



Overhead crane (above) holds drop-bottom container of conditioned sand over hopper.

out their molds in the traditional floors. Result was that gangways were narrow and the foundry floor, as large as it is, was crowded. Sand was conditioned on the floor where the castings were shaken out, tying up valuable space and requiring molders to use hot sand.

First step in modernizing the shop was to condition the heaps in two locations on either side of the furnace, the sand being moved to and from the sand screeners and aerators by means of front-end loading industrial trucks.

Overhead Hoppers Used

Next step was to eliminate the heaps on the floor by putting the sand in overhead hoppers. To do this, commercially-available hoppers (aluminum lined to prevent corrosion and sticking) with discharge gates were constructed to Northern's specifications by a foundry equipment manufacturer. These were mounted on structural steel stands fabricated locally. Not bolted to the floor, the movable hopper stands combine with the portable molding machines to give extreme flexibility and high production with low investment and low maintenance, both important factors in efficient foundry operation.

Tapered, light-metal flasks and jackets are used on all but the largest jobs which require tight steel flasks. Molds are still set out on the floor but not by the molders. Each molder has two roller conveyor sections on wheels for his completed molds. Carry-out men position the molds on the floor, rolling the conveyor sections to the desired spot before removing the

(Left) D-core material is mixed in portable muller, regular core sand in stationary muller in back. (Center) Most cores are made in blowers. (Right) Moving rack of green cores into core oven with powered hand truck.

molds to minimize effort. Three carry-out men are all that are required to keep up with the molders.

Molders pour their own molds, one of the factors accounting for the low hard iron scrap which is approximately five per cent. Carry-out men and spruers shift weights and jackets and handle the sulky ladles that take the iron to the most distant floors. Most ladles are hand-shanked, the men catching the metal as it pours continuously from both sides of the furnace at tapping time.

Smooth Concrete Floors Help

Smooth concrete floors throughout the plant make handling of sulky ladles easy, and make it possible for the front-end loaders to scrape the molding floors clean between heats. Three front-end loaders are used to transport sand and castings and a fourth is used in the yard for unloading sand and bringing coal from outdoor bins to indoor storage.

In addition to the hoppers, the screener-aerators, and the front-end loaders, three cranes bridging the center bay play an important role in sand handling. They handle drop-bottom bins of sand between conditioned sand storage and the hoppers. The crane men check on the hoppers and refill them as required. Two of the cranes, a 5-ton and a 3-ton, are used regularly and another 5-ton crane is on standby. In addition to handling conditioned sand, the cranes also lift furnace roof sections, charge the furnace, and move boxes of castings too delicate in the hard iron condition to be handled by front-end loader. Other crane service includes two jib cranes in the jolt-rollover, jolt-pin lift molding machine area for handling large flasks and molds.

Molding sand is based on a naturally-bonded Minnesota sand with an AFS grain fineness number of 160 and a clay content of 16 per cent. Approximately 200 tons are in use, about 60 per cent for the morning heat, the balance for the afternoon heat. Thus, freshly-conditioned sand from one heat tempers in the heap for almost 24 hours before being used again.

Facing Mixture Ingredients

About half of the molds are faced with a mix prepared in a 3/4-ton, heavy-wheel muller loaded by skip hoist. Facing mixture consists of the following:

Core Sand, 66 GFN	2 cu ft
New Molding Sand	1 cu ft
Heap Sand	7 cu ft
Fireclay	2 qt
Southern Bentonite	2 qt
Seacoal	4 qt
Gilsonite	2 qt
Wood Flour	5 qt
Water	4 %

Heaps are conditioned by wetting down with a hose immediately after shake-out and removal of castings. New sand is added on the lighter floors. On floors where heavier castings are made, fireclay and southern bentonite are added to supply additional bond. Heaps are then scraped by front-end loader to two spots adjacent to the center gangway where the sand is accumulated, one for regular heap sand, one for the sand with additional binder. The molding area is divided by the air furnace which cuts across the main gangway, and the sand is conditioned and stored at both ends of the aisle. Thus the sand piling is duplicated on each side of the furnace so that eventually the sand just used is heaped in four locations.

Front-end loader dumps heap sand into hopper. Screener-aerator discharges sand into bin at right.

Carry-out man simplifies molding floor make-up job with roller conveyor section fitted with casters.

Heaps Conditioned Next

Next step is to condition the heaps which is done by scooping them by front-end loader into screener-aerators, one located at each end of the molding area. These are stock units positioned under hoppers which are filled by front-end loaders. In case of a breakdown, the stock unit is easily rolled out of the way for repairs while a replacement is rolled in without loss of time.

The two types of heaps are run through separately so the sands are not mixed. The front-end loaders come into use again in the sand conditioning cycle when they move the screened and aerated sand to the storage heaps where it tempers until needed the following day. By the time the sand has passed through

(Left) Overhead supply of gravel and vibrator on pot speeds loading of annealing pots. (Above) Annealing pot ready to be shaken out is handled by long electric truck for maximum operational safety.

the complete cycle of handling it is remarkably uniform as shown by the graphs of properties of composite daily samples of the heaps. The samples are carefully collected to avoid random sampling and are tested for moisture, permeability, green compression, dry compression, deformation, toughness, and flowability. Trends are watched and appropriate corrections are made as soon as a distinct trend is noted. The sand properties never change suddenly.

Keys to sand control, according to Assistant Superintendent Art Johnson, are moisture and deformation. In all sands deformation is kept at 0.020-0.025 in. per in; average moisture for the heaps is 4.8 per cent, for the facing, 4.0 per cent. Green compression preferred is 8 psi in the heaps, 10 psi in the facing. Occasionally total combustibles are run, the value regularly ranging from 2.5-3 per cent.

Core production is almost 100 per cent by blowing. A Minnesota sand (GFN 66) bonded with one per cent polymerizing type oil by weight, and two per cent water, is used for most of the cores. This is mixed in a heavy-wheel muller loaded by skip hoist, the same size as the facing sand muller. For pin cores, strainer cores, gears used as cast, and other jobs where finish and close tolerances are required, the following special core mix is used:

Bank Sand, GFN 115	200 lb
Red Iron Oxide	5 lb
Fly Ash (obtained from local power company)	7 lb
D-Process Oil (bakes in 30 min)	5 lb

This mixture is prepared in a 300-lb portable muller and is used like a regular core mixture instead of for D-shells.

All cores are baked in a rack-type, natural gas-fired, recirculating oven. Racks are handled by electric truck.

The work day is divided into two parts by the two heats, a typical schedule being:

Start firing furnace	1:00 am
Start molding	7:00 am
Preliminary sample	9:00 am
Start pouring	10:15 am
Lunch hour for molders	11:00 am
Start firing second heat	11:15 am
Resume molding	12:15 pm
Preliminary sample	2:30 pm
Start pouring	3:30 pm

Although the nominal capacity of the furnace is 22 tons and can be extended to 25 tons, the heats are normally 22 tons in the morning and 15½ tons in the afternoon to keep the shift down to eight hours.

Pulverized Coal Used

The furnace is fired by pulverized coal and has a waste-heat boiler that provides steam for generating a third of the plant's power requirement. Furnace lining is high-duty silica brick for the side walls and bungs, and sand for the bottom. The bottom is rebuilt each weekend and is raised or lowered to accommodate the largest heat scheduled for the coming week. Side walls are patched on the weekend, and during the week if required.

A typical furnace charge consists of: pig iron, 30 per cent; malleable scrap, 20 per cent; and sprue, 50 per cent. Final composition desired is: C, 2.25-2.35 per cent; Si, 1.05-1.15; Mn, 0.30-0.40; S, 0.09-0.10; and P, 0.14-0.15. A preliminary analysis is made an hour before tapping on a granulated sample produced by

pouring molten iron on a slanting board leading into a bucket of water. The sample is crushed in a hardened mortar with an air driven pestle. Carbon and silicon are run on the preliminary sample, the complete analysis on the final sample.

Preliminary Analysis Used

Based on the preliminary analysis, ferrosilicon, ferromanganese, and petroleum coke are added as required. Correct addition of manganese is judged by the loss of silicon of the heat, and the manganese losses in previous comparable (morning or afternoon) heats.

Castings having been poured and the molds dumped, the castings are hooked out of the sand into the scoops of the front-end loaders. Certain castings that won't stand rough handling at this stage are carefully placed in trucks or boxes which are moved by crane. First stop for hard iron castings is the spruing bench where castings and sprues are separated. Castings go into boxes, sprues into charge makeup containers. The castings are lifted to an overhead platform from which they are loaded into tumbling barrels mounted off the floor so they can discharge on to trimming tables. Trimming of the (at this point) brittle castings is done by hand with small hammers. Castings under one pound are ground in the hard state. Above one pound, the gates are too heavy to grind economically.

After hard iron inspection, the castings are counted by weight using a counting scale, then are pushed in trucks to where they are packed for annealing. Though 25 per cent of the casting output is pearlitic, all castings are given the same malleable anneal. Annealing pots are built up by stacking four sections. As one section is packed with castings and gravel (discharged from an overhead storage hopper), another section is added. Pots are packed carefully to minimize distortion of castings during the anneal. Joints are mudded to exclude air and keep surface oxidation down. Tops and bottoms of the pots are loose plates and must be mudded too. Loaded pots, which weigh 1300 lb, are handled by a long electric truck. The length enables the truck operator to handle pots at the back of a hot oven without discomfort.

Each Oven Holds 52 Stacks

Each of the hand-fired, coal ovens holds 52 stacks. Temperature is controlled by checking the four thermocouples in each oven which connect through push-button selector switches to an indicator. A typical malleablizing cycle runs eight days. The castings are heated to 1550 F in 36 hr, then are held at that temperature for 60 hr. After sealing the oven, the temperature is allowed to drop to 1000 F at the rate of 5-6 degrees per hour.

The following day the stacks are removed and shaken out while held in a large air-operated clamp. Gravel is screened from the castings below floor level and returned to the overhead storage bin by bucket elevator. Castings slide into dump boxes suspended from a small monorail that handles malleable castings between the pot shake-out and the airless blast unit. A section of the monorail lowers to allow the dump boxes to receive castings in the shake-out pit. From the shot blast, the castings go to the stand grinders and then to final inspection and shipping. The approximately one third of the output that is ground in the hard iron state goes directly to inspection after blast finishing.

Composite, 24-in. diameter grinding wheels are used, first on soft iron until wheel diameter is down to 18 in., then on hard iron until diameter is 10 in. The grit used in the soft iron part of the wheel is one grade softer than the central part used on hard iron. Using a composite wheel eliminates the need for changing speeds or shifting smaller diameter wheels to other machines. Standard wheel speed is 9000 sfm.

Pearlitic malleable is produced by heating shot-blasted castings to 1450 F in gas-fired, recirculating, atmosphere-controlled furnace, and holding for an hour. After an oil quench, the castings are tempered to produce the desired properties, then given a final water quench.

Part of cleaning and finishing area with pot-dumping station at left. Monorail loop for handling annealed castings in center, and airless-blast tumbler at right.

Oil flares as load of pearlitic malleable castings is put through quenching operation.

Site of the 1955 AFS National Convention, Houston is industrial metropolis, oil capital, cotton center, ocean shipping port, and rich in the lore and tradition of the Southwest and Texas.

1955 AFS Convention Scheduled for Houston

American Foundrymen's Society will hold its 59th Annual Convention at Houston, Texas, May 23-27, 1955, marking the first time the meeting has been staged in the Southwest.

The Texas metropolis has excellent convention facilities, including more than 5200 modern hotel rooms and approximately 1000 motel accommodations. Air-conditioned convention and exhibit halls are conveniently located in the central area.

Houston is a shipping, manufacturing, oil, and cultural center for the entire Southwest. Its port ranks second nationally in total tonnage. Petroleum refining installations make the area the oil capital of the world. The city is one of the leading cotton markets of the nation.

More than a half-million people make their homes within the metropolitan limits of Houston. They enjoy one of the most equable climates in the United States. The city boasts nine bus lines, six major railroads, and eight airlines, making it easily accessible from any section of the country.

Seafood is a feature of the region, but Houston restaurants offer the visitor a wide variety of specialty and regional foods. Theatres, art museums, libraries, symphony orchestras, and sightseeing tours provide a broad selection of entertainment.

Of the nine advanced schools in Houston, the best-known are the University of Houston, Rice Institute, and installations of Baylor and Texas universities.

Founded in 1836 by J. K. and A. C. Allen, the city became one of the early capitals of the Republic of Texas. It was named for General Sam Houston, inspirational hero of the state in its srtuggle for independence from Mexico. The San Jacinto Monument, located just 18 miles from Houston, marks the location of the climactic battle against the Mexicans. The surrounding park is one of the historical show places of the area.

The city is located at the head of Galveston Bay and is connected with the Gulf of Mexico by a 50-mile, 300-foot wide channel, developed at a cost of $50 million. An excellent system of roads and expressways links Houston with the Gulf area and the scenic hill and bayshore resorts, which offer fishing, hunting, golf, riding, rodeos, and other types of recreation for the sportsman.

In the final inspection, castings are again checked for dimensional accuracy and to make certain that all required operations have been performed during production cycle.

Inspection and Salvage of Magnesium Castings

B. G. Harr / *Director, Quality Control, Bay City Foundry, Dow Chemical Co.*

Information on salvage procedures and customer acceptance was supplied in part by H. C. Cook, Aluminum Company of America and A. T. Ruppe, Bendix Aviation Corp.

B. G. Harr

■ Inspection and salvage of magnesium castings are important operations in the production of military aircraft parts. Inspection is a vital phase of a quality control program in order to maintain customer standards and to keep the foundry production department informed promptly as to the defects encountered during production runs of various castings. Salvage permits the saving of usable castings which otherwise would be needlessly scrapped.

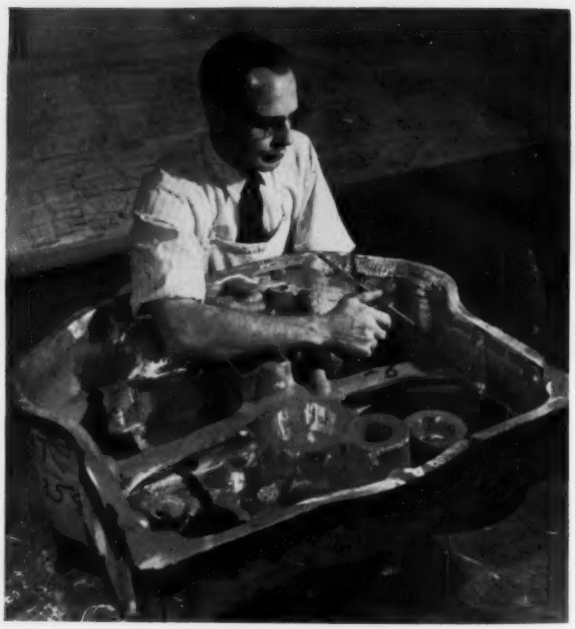
Inasmuch as the greater percentage of magnesium castings is being supplied to the aircraft industry, the discussion of inspection and salvage procedures which follows will deal with aircraft castings. The general principles, however, will apply to all types of castings.

Inspection procedures for magnesium castings do not differ markedly from those for other metals, so the discussion of such inspection procedures will cover highlights only.

Castings are put through their first inspection ("hot inspection") as soon as they have been shaken out of the mold and blast cleaned. This inspection removes from further processing all castings with large obvious defects such as dirt holes, misruns, and blow holes.

The second inspection, termed "rough casting inspection," takes place after the gates and risers have been removed and the castings have been pickled. The pickling operation, consisting of a sulphuric acid and chrome pickle in succession, opens the small defects and makes them easier to detect. The chrome pickle is made up with sodium dichromate and nitric acid in a water solution. This second inspection is the first critical examination to which the castings are subjected, and in this inspection foundry defects such as cold shuts, gas seams, cracks, small blow holes, and small sand holes are discovered. The castings are checked at this time with calipers, templates, and gages for dimensional discrepancies. From the foundry standpoint this inspection is extremely important, because it enables the inspection department to keep

The casting fixture is a special tool designed to accurately check critical dimensions and insure that adequate machining stock is available on all surfaces.



In the layout department, sample and production castings are checked for accuracy of equipment.

the foundry informed as to the defects being encountered so that necessary corrective action can be taken immediately to minimize the number of defective castings produced.

Control Methods

As with other metals, additional tools are available to the inspection department of a magnesium foundry operation such as pressure testing, radiography, fracture testing, fluorescent penetrant examination, and humidity chamber tests. These methods are constantly employed for control purposes, but are also incorporated in the inspection procedures when required.

Final inspection takes place after all heat treatments and finishing operations have been completed. At this time, the castings are again examined for foundry defects that have been disclosed during finishing or may have been missed during previous inspections. The castings are again checked for dimensional accuracy and inspected to make certain that all required operations have been performed satisfactorily. Thus all castings are given three visual examinations and two dimensional checks before being shipped. In the case of major complex castings, fixtures are often supplied by the customer. A casting fixture is a tool designed to accurately check the critical dimensions and to insure that adequate machining stock is available on all finished surfaces. Fixturing, when required, is the last inspection operation.

The layout department checks castings made from new equipment for dimensional accuracy before samples are submitted to the customer. Production castings are also checked by layout procedures to determine if excessive wear has occured on the equipment.

Castings that have been thrown out at various stages of inspection are reviewed by an inspection department supervisor who makes the final decision as to the disposition of the castings. Those he rejects are scrapped, those whose defects can possibly be repaired, he ends to the salvage department.

Even after close inspection during the various stages of processing in the foundry, the customer still finds some castings that have to be rejected. He is in a better position to make a final decision as to the usability of borderline castings than is the foundry.

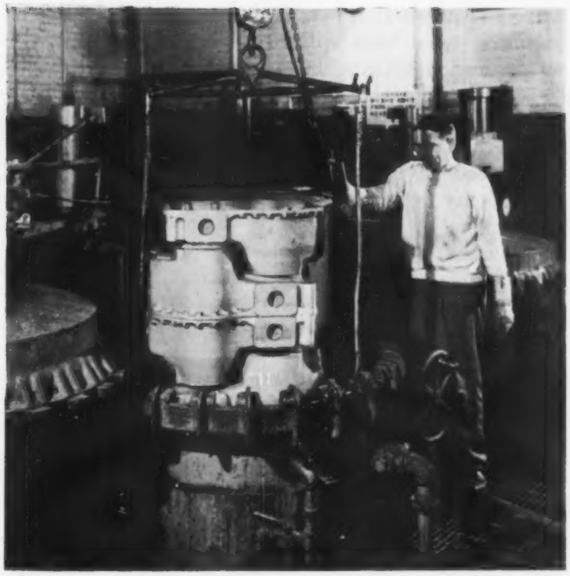
Salvage of Magnesium Castings

Salvage of magnesium castings is an important part of magnesium foundry practice because the customer receives usable castings that might otherwise have been scrapped due to small imperfections. The acceptance of sound salvaged castings makes more castings available to the customer in a shorter period of time so the foundry is better able to maintain production schedules. With the foundry operating at a higher efficiency, the economic advantage to the customer is increased.

While the methods of salvaging magnesium castings may vary from one plant to another, they fall into four main classifications—welding, peening, impregnating, and straightening. Customer approval must be obtained for all salvaging procedures.

In general, the internal specifications on procedures are so well known that the customer automatically starts procedures for welding repair of magnesium castings when the castings are ordered. This involves furnishing of marked prints or photographs by the customer, which point out critical areas where welding is not allowed. All welding is performed in accordance with applicable government specifications.

The inspection department examines the castings carefully and determines the extent of the defects and whether they can be repaired by welding. The defects or the areas to be welded are plainly marked and the parts sent on to the welding department.



Impregnating magnesium castings by styrene process.

Here the marked defects are again checked against the welding charts or prints of the parts before preparing the castings for repair.

After the preliminary details have been performed, the defects are completely routed out with the proper tools and the areas surrounding the defects are wire brushed. The castings are then uniformly preheated at the proper temperature. Some defects in certain castings can be repaired without preheating.

Use of Gas Torch

All repair welding is performed by the inert-gas-shielded arc welding process using a tungsten electrode and helium or argon gas as the inert atmosphere. During the welding process it is advisable not to allow the temperature of the castings to fall below 650 F, and to maintain the proper temperature range, it is permissable to use a gas torch. The temperature of the castings can be checked during the welding with a contact pyrometer or temperature-indicating pills or crayons. To insure a sound weld, the welding should be done with the greatest speed consistent with thorough penetration. After each pass the weld bead should be wire brushed. Welding should be done in a sheltered area to avoid drafts. Upon completion of the welding the castings should be allowed to cool slowly to room temperature.

Magnesium welding rod, 3/32 to 5/32 in. in diameter, of the proper alloy, should be used for welding unless otherwise specified by the customer. All welding rods should be cleaned with steel wool immediately before use. Other accepted practices in welding magnesium castings are the use of tungsten electrodes, 1/16 to 3/16 in. in diameter, a 10-volt maximum arc voltage, current range from 20 to 60 amperes, and a helium or argon flow of 6 to 20 liters per minute.

Record All Welds

As a method of quality control of welds and as a means of keeping an accurate record, both while the parts are in process and in use by the customer, each casting to be repaired is assigned a weld number. This number is used on the radiograph of the weld, and all pertinent data is tied in with it. The weld serial number and data become a part of the permanent record.

Repair welding of magnesium castings is closely controlled by experts. All welding is performed in accordance with applicable government specifications.

After the repair welds have been made, the welded castings must be identified. This must include the welder's identification, the weld serial number, and the standard three concentric circles, ¼ in. in diameter which indicates that the castings have been welded.

The castings are stress relieved and the excess metal cleaned from the weld to within 1/32 in. of the casting surface. After this treatment all welds are inspected, preferably by x-ray, for soundness. Alternate inspection methods are fluorescent oil penetrant examination, pressure testing, or polishing and etching.

Peening for Surface Defects

Peening is one method of repairing minor surface defects which have no effect on the function of the cast part. The minor defects which may be repaired by peening are sand holes, blow holes, and seepage leaks. The repair may be done either hot or cold, with hot peening at a temperature of 350 to 400 F being desirable for most repairs.

The peening is done with a blunt-nosed tool driven by a low pressure pneumatic hammer. The operation is performed with a circular motion which causes the metal to flow toward the surface imperfection being repaired. During the hot peening operation, an oxy-acetylene torch is played on the area being worked in order to maintain a proper temperature. After this

Straightening magnesium castings.

X-ray inspection of magnesium castings, a modern tool of quality control, discovers hidden defects in castings and insures a better, sounder product.

operation the peened area is cleaned, blast cleaned, and chrome pickled. All peened castings are marked in a designated location with a maltese cross followed by the letter "H" in the case of hot-peened castings, and merely by the maltese cross for cold-peened castings.

Impregnation

Castings for a wide number of applications are required to be leak-proof. To insure this, all such castings are subjected to pressure tests as specified on the blue print. After testing, only those castings which weep or sweat but do not contain visible blow holes or other defects are impregnated. If, after two impregnations, the castings still leak they are rejected as scrap. When it is specified that castings are to be supplied in a heat treated condition, all solution, aging, and stabilizing treatments must be performed before impregnation.

Magnesium castings are impregnated by a number of methods and with a number of impregnants. Regardless of the method or impregnant used, the castings are prepared for impregnation by the following steps:

1. Pickle in an acid solution to insure that the porous areas are open to the surface.
2. Heat the castings to insure dryness.
3. Cool to the proper temperature for the method employed.

Three general methods of impregnation are in common use.

1. Vacuum-pressure system. In this method the castings are subjected to a vacuum followed by immersion in the impregnant under pressure.
2. Immersion of the castings in a heated bath of the impregnant.
3. Filling the individual castings with impregnant and applying pressure to the impregnant.

The porous areas of the castings properly treated by any of the above methods will be filled with liquid impregnant. The castings are now washed with the proper solvent to remove the excess impregnant from the surface and recesses. Following the cleaning operation the castings are baked at the proper temperature to convert the impregnant from the liquid to the solid state.

Magnesium castings have been impregnated with approved materials have given satisfactory service in aircraft applications operating up to 400–500 F. All impregnated castings are marked with the letters IMP in the area indicated on the drawings.

Castings Can Be Straightened

Straightening of magnesium castings is considered a normal processing operating necessary to conform to dimensional tolerances. The best practical method of straightening magnesium castings is the gradual application of pressure while the castings are held in a fixture. The straightening may be faciliated by heating the castings to the proper temperature for the alloy being processed before pressure is applied.

In some cases the castings may be straightened by racking them in a certain position and heating them to the specified temperature in a heat treating oven. Some castings can be straightened by striking with a rawhide mallet when the castings are properly supported.

All straightened castings must be subjected to the proper stress relieving treatment to insure that no residual stresses remain.

In regard to customer acceptance of salvaged magnesium castings, the limitations of procedures are defined in customer and military specifications, as well as internal specifications within the foundry. The success of any salvaging procedure or operation is dependent on the controls exercised. Magnesium castings salvaged by accepted methods with proper control are of the same quality and serviceability as regular production castings.

Some Effects of Nitrogen in Cast Iron—Part 2

J. W. Dawson, L. W. L. Smith, and B. B. Bach / *B.C.I.R.A. Research Dept.*

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This installment completes a paper originally appearing in the June 1953 issue of the *B.C.I.R.A. Journal of Research and Development*. The first installment was published in the July AMERICAN FOUNDRYMAN.

Malleable Iron. A malleable iron melt, No. 8, was divided into three taps. As before, one tap was untreated, one lightly treated with nitrogen and one heavily treated. Chemical analyses are shown in Table 7. Each tap was cast into four shaped tensile bars and one 0.875-in. diameter bar. Considerable bleeding and mushrooming took place with the heavily treated metal and the tensile bars were distorted and showed a spongy fracture. The heads of the 0.875-in. bars are shown in Fig. 9.

Fig. 9—Melt No. 8. Heads of 0.875-in. bars. Nitrogen content: (left) 470 ppm; (center) 240 ppm; (right) 70 ppm.

Pieces 1-in. long were cut from the bottom of the three bars for a preliminary test on first stage annealing. Four specimens from each bar were sealed into graphite pots to reduce oxidation and placed in a furnace at 950 C. One specimen from each bar was taken out after 8, 24, 48 and 72 hours and examined microscopically. No graphitization had taken place in any of the bars after 8 hours. The untreated specimen showed considerable graphitization after 24 hours, the lightly treated one rather less, and the heavily treated one very little. This pattern was followed up to 72 hours, when little carbide remained in the lightly treated bar but a considerable amount in the heavily treated bar. All the nodules were large and few in number. This effect is typical of rapid heating.

Repeated With Slower Heating Rate

This experiment was repeated with a slower heating rate to establish whether nitrogen still had the same carbide stabilizing effect under these conditions. Slow rates of heating are known to increase the nodule number and thereby increase the rate of graphitization. The samples were placed in a cold furnace and heated to 950 C during a period of 7 hours. As might be expected, the rate of graphitization increased, the

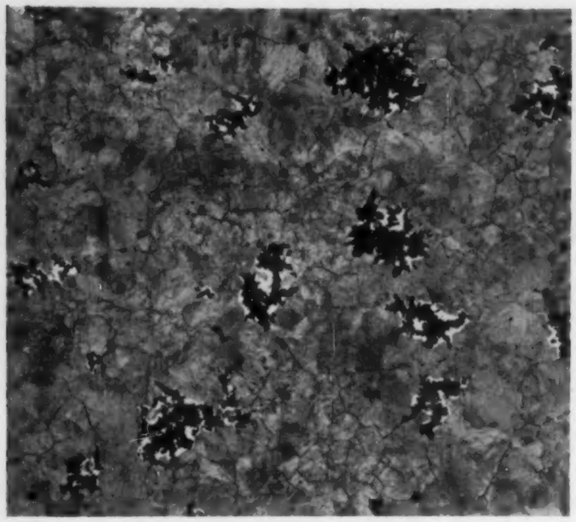

Fig. 10—Melt No. 8a. Etched in 4 per cent Picral X 100. Heating rate, 950 C for 48 hr. N=70 ppm.

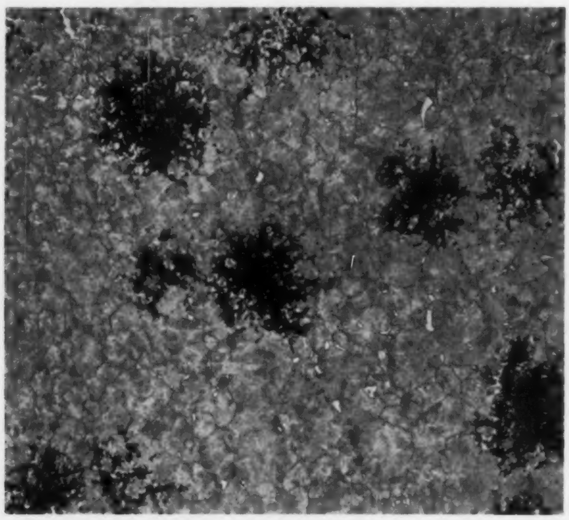

Fig. 11—Melt No. 8b. Etched in 4 per cent Picral X 100. Heating rate, 950 C for 48 hr. N=240 ppm.

untreated bar being almost free from carbide after 24 hours and completely free after 48 hours. A little carbide remained in the lightly treated bar and a large amount in the heavily treated one after 48 hours.

The amounts of carbide remaining in the heavily and lightly treated bars after 96 and 48 hours respectively were virtually the same. This time, in the untreated bar, the nodules were finer and more numerous but the treated bars again contained large nodules and they were few in number. (Fig. 10-13.)

Dilatometer Tests Carried Out

Dilatometer tests were carried out on specimens prepared from the gauge length of the corresponding as-cast tensile bars. This apparatus enables a very accurate measure of dimensional changes to be taken under closely controlled thermal conditions in an inert atmosphere of pure dry argon. The results are shown in Fig. 14a and 14b. It can be seen that nitrogen very considerably increases the time for completion of both first and second stage annealing. The nodules were again coarsened by the addition of nitrogen.

In all cases after annealing, there was a continuous graphite rim at the edge of the specimens. The reason for this is obscure but it may be that graphitization takes place more easily at the surface where expansion is less restricted. The significant point, however, is that a completely inert atmosphere must have existed for the preservation of this graphitic rim. This was also confirmed by the very small changes in weight that occurred during the annealing cycles.

Three comparable series of bars (Melts No. 9-11) were then prepared with increasing nitrogen contents. Melt No. 9 received no aluminum addition and Melts No. 10 and 11 received 0.01 per cent Al and 0.06 per cent Al additions respectively. Analyses are shown in Table 7. The aluminum was added in the ladle before the nitrogen addition.

Bars from each series were annealed in an industrial annealing cycle that usually produces a ferritic iron with this basic composition when 0.01 per cent aluminum is added. The first series, Melt No. 9 (no aluminum) was not entirely free from pearlite even at the lowest nitrogen content (70 ppm). There was, however, a coarsening of the nodules as the nitrogen content increased. The second series, Melt No. 10, with 0.01 per cent aluminum added, gave a completely ferritic structure except near the edge up to 140 ppm nitrogen. Above 140 ppm a considerable amount of pearlite remained and the nodules were again coarser.

Nodules Were Finer

The nodules in the two bars of the second series with the lowest nitrogen contents (10a and 10b) were finer than those in the corresponding bars of the first series. In the third series, Melt No. 11, with 0.06 per cent aluminum added, no pearlite was present even at the edge until the nitrogen content was above 120 ppm. At 160 ppm a trace of pearlite remained at the edge. Above 160 ppm there was pearlite present throughout. It should be noted, however, that the aluminum as determined spectrographically in the sample above 160 ppm was only 0.02 per cent. As the nitrogen content increased above 120 ppm, so the nodule size increased. Below 120 ppm the nodules were fine and numerous. Mechanical properties are also given in Table 7.

Dilatometer tests were carried out on as-cast specimens prepared from these series. Once again the increase in the first and second stage annealing times was revealed and the effect of aluminum on these annealing times was very pronounced. Expansion-time curves are given in Fig. 15a, 15b, 16a, 16b.

The effect of boron additions in the presence of varying amounts of nitrogen is also being investigated.

Effect of Nitrogen on Pearlite Stability. In the above experiments, the increase in second stage annealing times might have been due solely to the reduction in nodule number. An experiment was therefore devised to discover whether nitrogen affected the stability of

pearlite when the graphite formation was substantially constant. A series, Melt No. 12, of gray iron bars with increasing nitrogen contents was prepared. The compositions are given in Table 8.

All the bars had a pearlitic matrix with no free cementite. Pieces were cut from corresponding positions in the five bars and annealed for various periods up to 24 hours at 690 C in a salt bath. As the nitrogen content increased, so the rate of decomposition of the pearlite decreased. This was especially noticeable in the initial stages. For example, after 4 hours the sample with lowest nitrogen was almost ferritic whereas the corresponding highest nitrogen sample was still pearlitic. The structures of these two bars are given in Fig. 17 and 18. Brinell hardness numbers and combined carbon determinations confirmed these results. Brinell hardness is plotted against time in Fig. 19.

A series similar to Melt No. 12, but with approximately 0.1 per cent Al added after the nitrogen addition, was given a similar annealing treatment and Brinell hardness figures obtained. The analyses of this series, Melt No. 13, are included in Table 8 and Brinell hardness-time curves for two of the bars are shown in Fig. 19. The other three curves lie between the two shown and it is clear that the stabilizing effect of nitrogen on the pearlite is completely neutralized by the addition of 0.1 per cent aluminum. Microexamination of the samples from both series confirmed these findings.

Bleeding Occurred from the Heads

In Melt No. 12 bleeding occurred from the heads of the two bars with the highest nitrogen contents (12d and 12e) although the lower part of the bars was sound. The addition of aluminum to Melt No. 13 appeared to eliminate this bleeding.

Some interest attaches to the mode of occurrence of the nitrogen in cast iron. In the absence of nitride-forming elements such as titanium, etc., it is presumed that nitrogen exists in solution. There is evidence that in the presence of aluminum, the nitrogen appears in the microstructure as very small idiomorphic, dark gray crystals of aluminum nitride.[14] Figure 20 shows a segregation of similar crystals found in an iron of the following composition:

Total carbon	3.54	pct
Silicon	1.90	pct
Manganese	0.38	pct
Sulphur	0.013	pct
Phosphorus	0.035	pct
Aluminum	0.13	pct
Nitrogen	200	ppm

The idiomorphic character of these particles and the fact that they occur in segregations suggest that they have only a limited solubility in the liquid iron.

Nodular Iron. Four pairs of nodular keel block castings, Melt No. 14, were prepared by the magnesium process. Tap 14a received no nitrogen addition and Taps 14b, c and d received progressively increasing nitrogen additions. The nitrogen was added prior to the addition of the nickel-magnesium alloy.

Tensile bars were machined from one of each as-cast pair of blocks. The results showed that with increasing nitrogen a slight increase in the ultimate tensile stress and the hardness number was obtained, but with no obvious trend in the elongation. These results are shown in Table 9 and the chemical analyses in Table 10. It will be seen that the increase in nitrogen is small but even so microexamination showed a definite increase in the amount of pearlite present as the nitrogen increased. This melt was repeated with heavier nitrogen additions (Melt No. 15, Tables 9-10) and this time a considerable increase in the tensile strength and a corresponding reduction in elongation were obtained. Also, the increase in the amount of pearlite was more pronounced.

Even with heavy additions of nitrogen the increase in nitrogen content was relatively small. Recent experiments have shown that some nitrogen is eliminated during treatment with nickel-magnesium, presumably in the from of magnesium nitride.

From the results on malleable iron it was expected

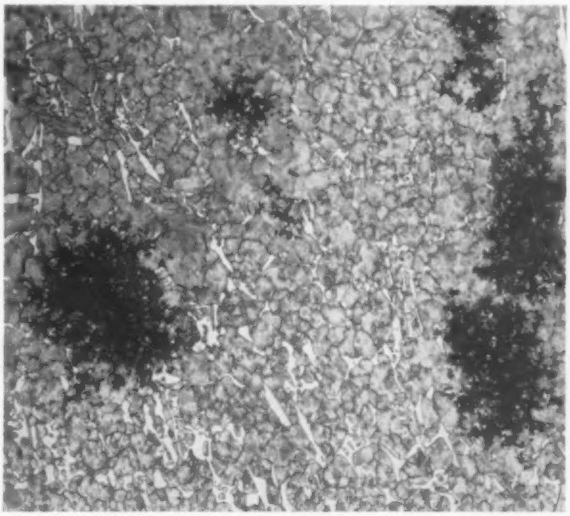

Fig. 12—Melt No. 8c. Etched in 4 per cent Picral X 100. Heating rate, 950 C for 48 hr. N=470 ppm.

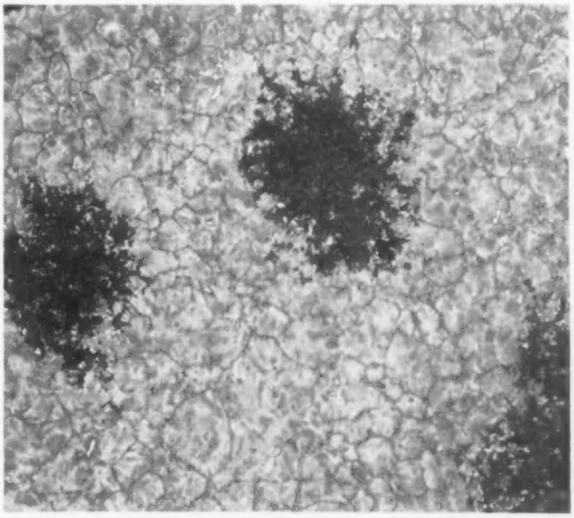

Fig. 13—Melt No. 8c. Etched in 4 per cent Picral X 100. Heating rate, 950 C for 96 hr. N=470 ppm.

TABLE 7—ANALYSES AND MECHANICAL PROPERTIES OF MALLEABLE IRON: MELTS NOS. 8-11

Melt No.	TC per cent	Si per cent	Mn per cent	S per cent	P per cent	Al per cent	p p m	Yield Stress tons/sq. in.	Ultimate Tensile Stress tons/sq. in.	Elongation per cent on 2 in.
8a	3.05	0.55	0.37	0.101	0.057	0.01	70	....	....	..
8b	3.07	0.56	0.36	0.100	0.060	0.01	240	....	....	..
8c	3.11	0.54	0.37	0.080	0.070	0.01	470	....	....	..
9a	3.14	0.52	0.32	0.107	0.059	n d	70	12.6	22.6	14
9b	3.14	0.52	0.32	0.099	0.058	0.01	70	12.1	20.8	15
9c	3.17	0.52	0.32	0.106	0.059	n d	125	14.4	24.6	8
9d	3.17	0.52	0.32	0.103	0.059	n d	185	13.05	25.3	10
9e	3.18	0.50	0.32	0.099	0.061	n d	260	14.1	25.0	9
9f	3.19	0.50	0.33	0.096	0.062	n d	285	14.1	24.0	9
10a	3.00	0.53	0.38	0.111	0.055	n d	75	10.8	21.8	18
10b	2.99	0.53	0.37	0.115	0.056	n d	140	11.2	22.4	18
10c	2.98	0.53	0.37	0.109	0.056	n d	185	12.7	25.8	15
10d	2.98	0.53	0.37	0.103	0.057	n d	275	12.1	25.7	14
10e	3.00	0.52	0.37	0.103	0.057	n d	280	13.6	26.4	11
11a	2.93	0.48	0.29	0.105	0.059	n d	85	12.2	23.6	15
11b	2.97	0.48	0.30	0.109	0.054	0.06	85	11.1	19.1	16
11c	2.95	0.50	0.29	0.106	0.058	0.06	125	11.1	19.5	15
11d	3.02	0.50	0.29	0.106	0.056	0.06	160	11.8	19.2	13
11e	2.95	0.48	0.29	0.100	0.056	0.02	235	13.5	24.4	13
11f	2.92	0.48	0.29	0.100	0.060	0.02	240	13.7	24.7	11

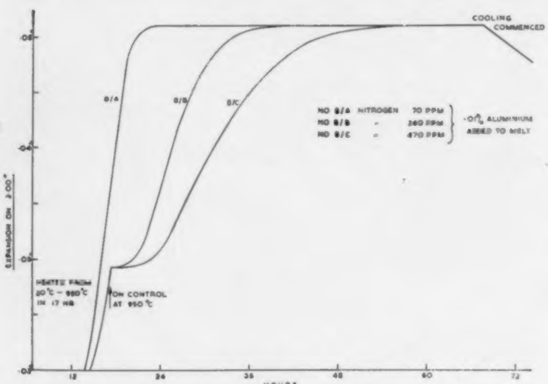

Fig. 14a—Nitrogen and first stage graphitization.

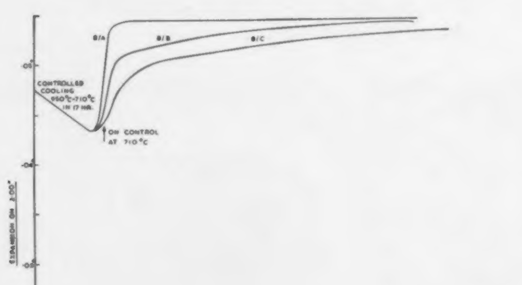

Fig. 14b—Second stage graphitization. Iron No. 8.

that aluminum would tend to eliminate this increase in pearlite. The previous melt was therefore repeated with 0.1 percent Al added together with the ferrosilicon inoculant (Melt No. 16). However, the mechanical properties still showed an increase in strength, coupled with a decrease in elongation and an increase in hardness (Tables 9-10).

At this stage it was not known whether the increase in strength was due solely to the pearlite or whether nitrogen had an effect on the ferrite. To ascertain whether this was so, the duplicate blocks were annealed at 900 C for 24 hours and at 700 C for 48 hours to obtain a completely ferritic matrix. Similar mechanical tests were carried out and show (Table 9) that nitrogen has little, if any, effect on the ferrite; it may be assumed that the increases in strength previously obtained were due to the changes in pearlite content.

Effect of Silicon on Solubility of Nitrogen. Examination of the nitrogen contents of a number of treated melts suggested that it was more difficult to introduce nitrogen as the silicon increased.

First Tap Was Untreated

Melt No. 17 was prepared containing 5 per cent silicon. The first tap (17a) was untreated but the subsequent five taps (17b-17f) received increasing additions of nitrogen. Various diameter bars were cast from each tap. Microexamination of these bars showed that the nitrogen continued to stabilize the pearlite in the presence of 5 per cent silicon. The highest nitrogen iron was completely pearlitic while the untreated iron was ferritic. A feature of this series was the band of ferrite present around the edge of the bars. This is contrary to what might be expected from the cooling

TABLE 8—ANALYSES OF MELTS NOS. 12 AND 13

Melt No	TC per cent	Si per cent	Mn per cent	S per cent	P per cent	N p p m	Al per cent
12a	3.20	1.82	0.72	0.099	0.106	70	n d
12b	3.34	1.91	0.73	0.091	0.107	120	n d
12c	3.34	1.88	0.73	0.089	0.106	170	n d
12d	3.33	1.91	0.73	0.080	0.113	195	n d
12e	3.32	1.88	0.73	0.079	0.113	240	n d
13a	3.26	1.73	0.62	0.095	0.110	80	0.13
13b	3.32	1.80	0.65	0.078	0.112	130	0.13
13c	3.36	1.76	0.65	0.077	0.122	185	0.14
13d	3.39	1.73	0.65	0.080	0.124	230	0.15
13e	3.36	1.72	0.61	0.078	0.125	240	0.12

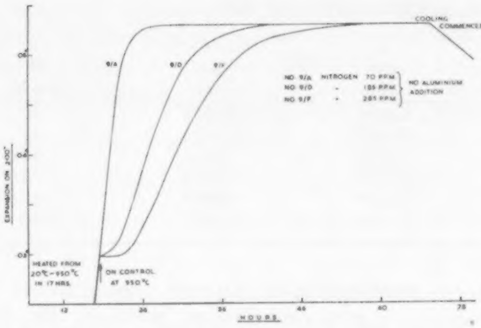

Fig. 15a—First stage graphitization. Iron No. 9.

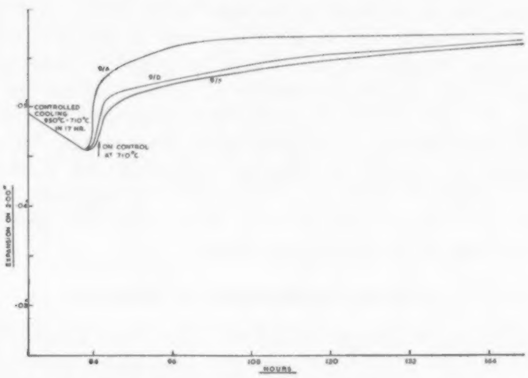

Fig. 15b—Second stage graphitization. Iron No. 9.

rates, but a possible explanation is that it is due to the migration of nitrogen into the center of the bar as the edge freezes. The chemical analyses are show in Table 11.

It is clear that it is possible to increase the nitrogen content even in the presence of 5 per cent silicon. The nitrogen content of the most heavily treated specimen, however, was only about a quarter of that obtained in a similarly treated low silicon malleable iron.

Finally, a high frequency melt of a silvery pig containing 13 per cent silicon was heavily treated with nitrogen, samples being taken before and after treatment. The nitrogen content showed very little change, samples before treatment containing 25 ppm, and after treatment 35 ppm. This confirms that using the methods described in this report, silicon renders more difficult the introduction of nitrogen into molten cast iron.

Conclusions. These experiments show that when molten cast iron is treated with fluxed ferrocyanides, cyanamides, or similar nitrogen-containing compounds, the nitrogen content of the metal can be considerably increased, increases from 30 ppm to 500 ppm being possible. Nitrogen exerts a profound influence on the properties and structures of these treated irons. It has a strong stabilizing effect on cementite and pearlite in a number of types of cast iron, even in quantities as low as 100 ppm (0.01 per cent).

In as-cast hypoeutectic and hypereutectic gray irons and nodular irons the amount of combined carbon

TABLE 9—MECHANICAL PROPERTIES OF NODULAR IRON: MELTS NOS. 14-16

Melt No.	Yield Stress tons/ sq. in.	Ultimate Tensile Stress tons/ sq. in.	Elongation per cent on 2.82-in.	Brinell Hardness No.	Yield Stress tons/ sq. in.	Ultimate Tensile Stress tons/ sq. in.	Elongation per cent on 2.82-in	Brinell Hardness No.	N p p m
14a	17.9	31.4	18	176	17.8	26.4	24	148	55
14b	18.9	30.6	5	185	17.7	25.8	25	146	55
14c	18.0	33.8	16	186	17.6	25.8	25	149	65
14d	17.2	35.1	14	188	17.6	25.7	26	148	75
15a	17.3	31.4	19	177	17.4	26.6	25	141	65
15b	17.6	31.9	18	184	15.8	25.6	20	136	80
15c	16.0	36.1	13	198	15.8	24.8	28	130	120
15d	18.0	38.6	11	207	16.1	25.0	27	129	130
16a	20.2	29.5	19	170	17.6	26.4	27	138	50
16b	21.6	33.2	12	181	17.0	26.5	26	139	90
16c	22.8	37.8	8	213	16.1	24.8	28	130	95
16d	22.7	37.1	11	207	15.5	24.6	28	130	105

TABLE 10—ANALYSES OF NODULAR IRON: MELTS NOS. 14-16

Melt No.	TC per cent	Si per cent	Mn per cent	S per cent	P per cent	Ni per cent	Mg per cent	N p p m	Al per Cent
14a	3.59	2.29	0.44	0.015	0.025	0.73	0.058	55	n d
14b	3.66	2.28	0.44	0.015	0.023	0.77	0.086	55	n d
14c	3.67	2.23	0.43	0.015	0.025	0.76	0.065	65	n d
14d	3.65	2.20	0.43	0.013	0.028	0.72	0.055	75	n d
15a	3.47	2.08	0.42	0.014	0.028	0.68	0.059	65	n d
15b	3.55	1.95	0.41	0.019	0.033	0.55	0.048	80	n d
15c	3.60	1.77	0.42	0.017	0.032	0.56	0.051	120	n d
15d	3.57	1.80	0.41	0.014	0.036	0.68	0.060	130	n d
16a	3.48	2.07	0.43	0.011	0.016	0.55	0.060	50	0.11
16b	3.54	2.10	0.45	0.010	0.024	0.51	0.059	90	0.11
16c	3.59	1.77	0.44	0.011	0.026	0.51	0.058	95	0.11
16d	3.54	1.76	0.44	0.010	0.029	0.49	0.051	105	0.12

TABLE 11—ANALYSES OF 5 PER CENT SILICON: MELT NO. 17

Melt No.	TC per cent	Si per cent	Mn per cent	S per cent	P per cent	N ppm
17a	2.67	4.99	0.10	0.026	0.026	40
17b	2.78	5.00	0.09	0.026	0.036	40
17c	2.75	5.00	0.09	0.024	0.036	55
17d	2.78	5.00	0.09	0.023	0.044	70
17e	2.77	4.99	0.09	0.022	0.041	80
17f	2.82	4.94	0.10	0.020	0.041	100

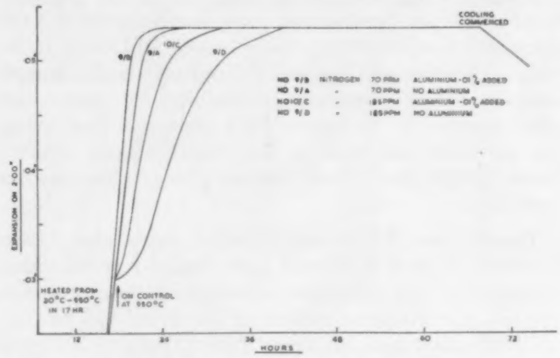

Fig. 16a—Neutralizing effect of aluminum, first stage graphitization. Irons Nos. 9 and 10.

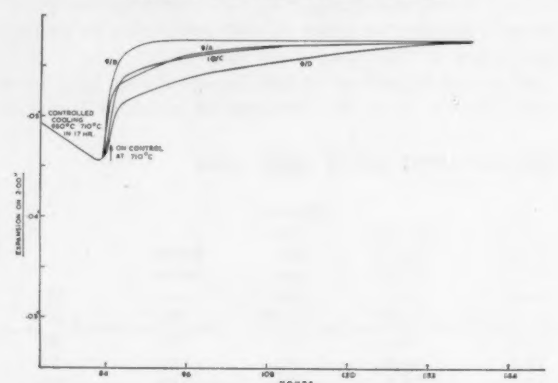

Fig. 16b—Second stage graphitization. Nos. 9 and 10.

increases with increasing nitrogen. The graphite flake formation in gray cast iron is modified, the flakes becoming shorter, thicker and more curved.

An increase in the amount of pearlite in gray irons produces an increase in the transverse, tensile, and impact strengths. These improvements in strength may be due in part to the change in graphite flake formation, since the formation of massive cementite is clearly detrimental to such irons. Excessive additions of nitrogen can cause porosity in the castings. An increase in pearlite in nodular iron causes an increase in tensile strength and a reduction in elongation. The presence of nitrogen has no effect when this iron is annealed to a ferritic condition.

Reduces the Solubility of Nitrogen

The experiments carried out with irons containing 0.5-13.0 per cent silicon suggest that this element reduces the solubility of nitrogen. This is in agreement with the effect of silicon on nitrogen solubility in pure iron reported in the literature. Although the solubility is reduced by silicon, nitrogen will still produce a pearlitic iron in the presence of 5 per cent silicon.

The carbide stabilizing effect is also evident in the annealing of malleable iron, the times for the first and second stages of anneal being considerably increased by the addition of nitrogen. This is accompanied by an increase in the size and reduction in the number of nodules. These effects are detrimental to the production of malleable iron. Small additions

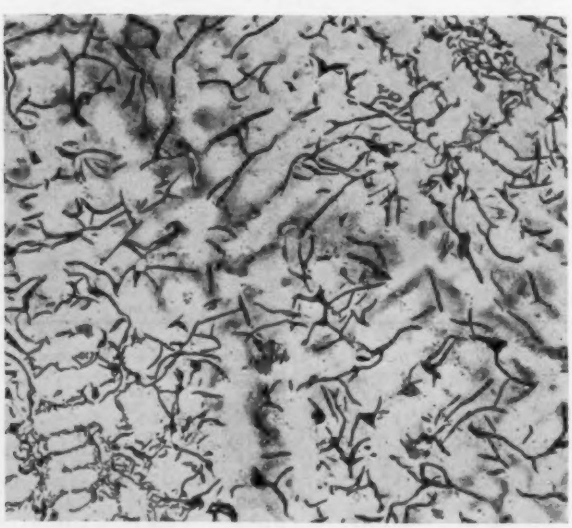

Fig. 17—Melt No. 12a, ½-in. bar. Etched in 4 per cent Picral X 100. 690 C for 4 hr. N=70 ppm.

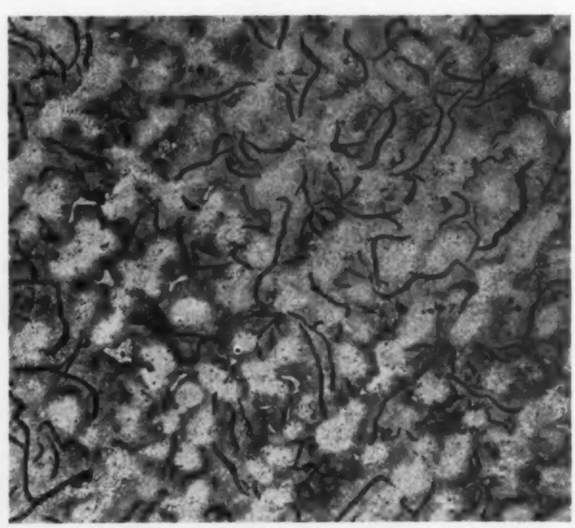

Fig. 18—Melt No. 12e, ½-in. bar. Etched in 4 per cent Picral X 100. 690 C for 4 hr. N=240 ppm.

of aluminum reduce these effects of nitrogen, the amount of aluminum required increasing with increasing nitrogen. This neutralizing effect is probably due to the fixation of nitrogen as stable aluminum nitride. In view of the marked effect of aluminum on malleable iron it is remarkable that the addition of 0.1 per cent of aluminum to a nitrogen-treated nodular iron was entirely without effect. No explanation for this fact can be given at present but work is continuing.

Results Confirm Carbide Stabilizing

The results obtained confirm the carbide stabilizing effect of nitrogen already noted in carbon steels. The effect of aluminum in neutralizing the effects of nitrogen has also been confirmed. The effect of nitrogen on embrittlement, if any, has not yet been investigated. In the case of nodular iron, the only increase in strength due to the presence of nitrogen is that which arises from an increase in amount of pearlite in the as-cast condition. Nitrogen has no apparent effect on the tensile properties of the completely ferritic annealed material.

Wide Range of Nitrogen Contents Exists

Samples taken from foundries melting different types of cast iron, using a variety of furnaces and fuels, showed that a wide range (20 to 150 ppm) of nitrogen contents exists in commercial cast irons. This range is of the same order as the variations mentioned in this paper. It is to be expected that effects similar to those produced by the deliberate addition of nitrogen will occur in these commercial irons. This may be the case in the malleable iron industry where the addition of small amounts of aluminum to improve annealing is an established practice.

It has usually been assumed in the past that the graphitizing influence of aluminum in malleable irons is the result of its combination with oxygen. The work reported here has not completely disproved this assumption but it has shown that at least a part of the graphitizing effect of aluminum is due to the neutralization of the carbide stabilizing effect of nitrogen.

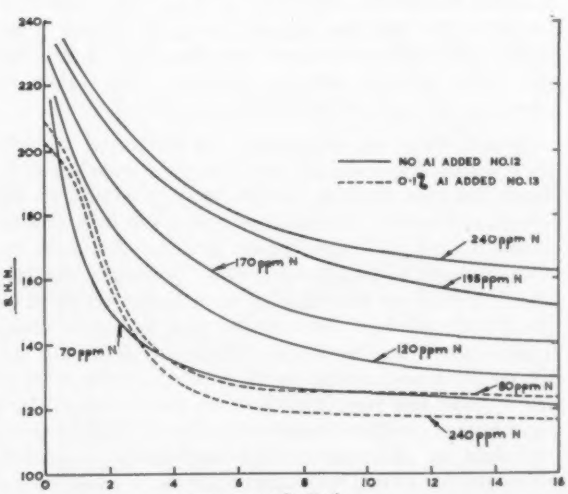

Fig. 19—Pearlite stability with increasing nitrogen and neutralizing effect of aluminum.

Fig. 20—Appearance of aluminum nitride crystals. Unetched X 1500 N=200 ppm.

Acknowledgments

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How to Design an Exhaust System

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Step-by-step calculations for this typical foundry exhaust system are simplified by a nomograph developed by the AFS Dust Control & Ventilation Committee. The article is taken from Section 3 of the forthcoming publication *Exhaust System Design and Exhaust Hoods* which the committee is issuing section by section.

■ The exhaust system shown on page 53 was calculated as a balanced system, i.e., the branches from any one point will have the same pressure drop. Results are shown on the calculation sheet (Table 1). All values obtained were either taken from the nomograph (pages 51-52) or calculated on a 5-in. slide rule. In many cases a check will reveal that values were read carelessly. Though we don't advocate such practice we would point out that due to the range of the nomograph no appreciable error results. Here's how the calculations were made.

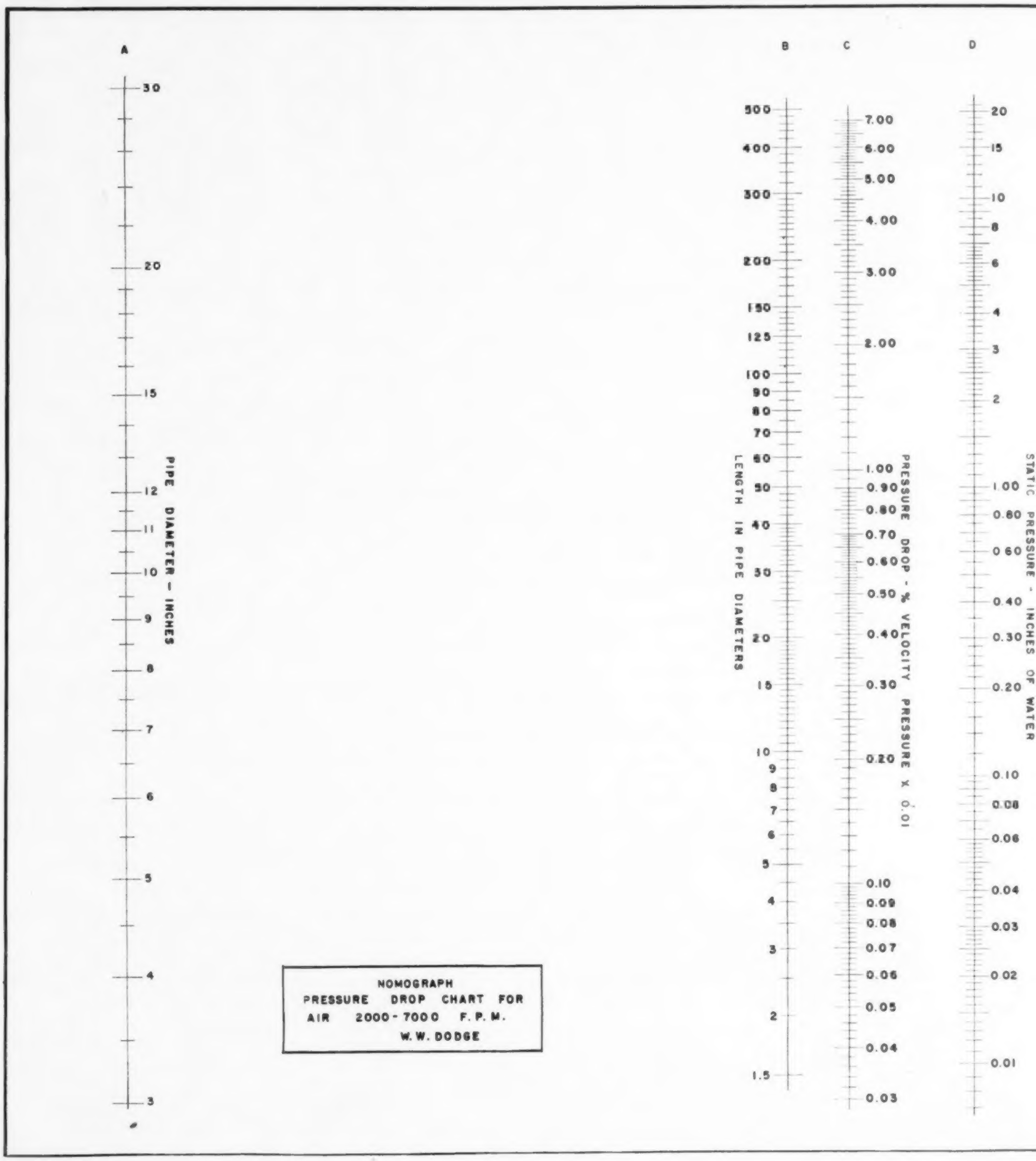
Calculations for tumbling mill are shown in Step 14.

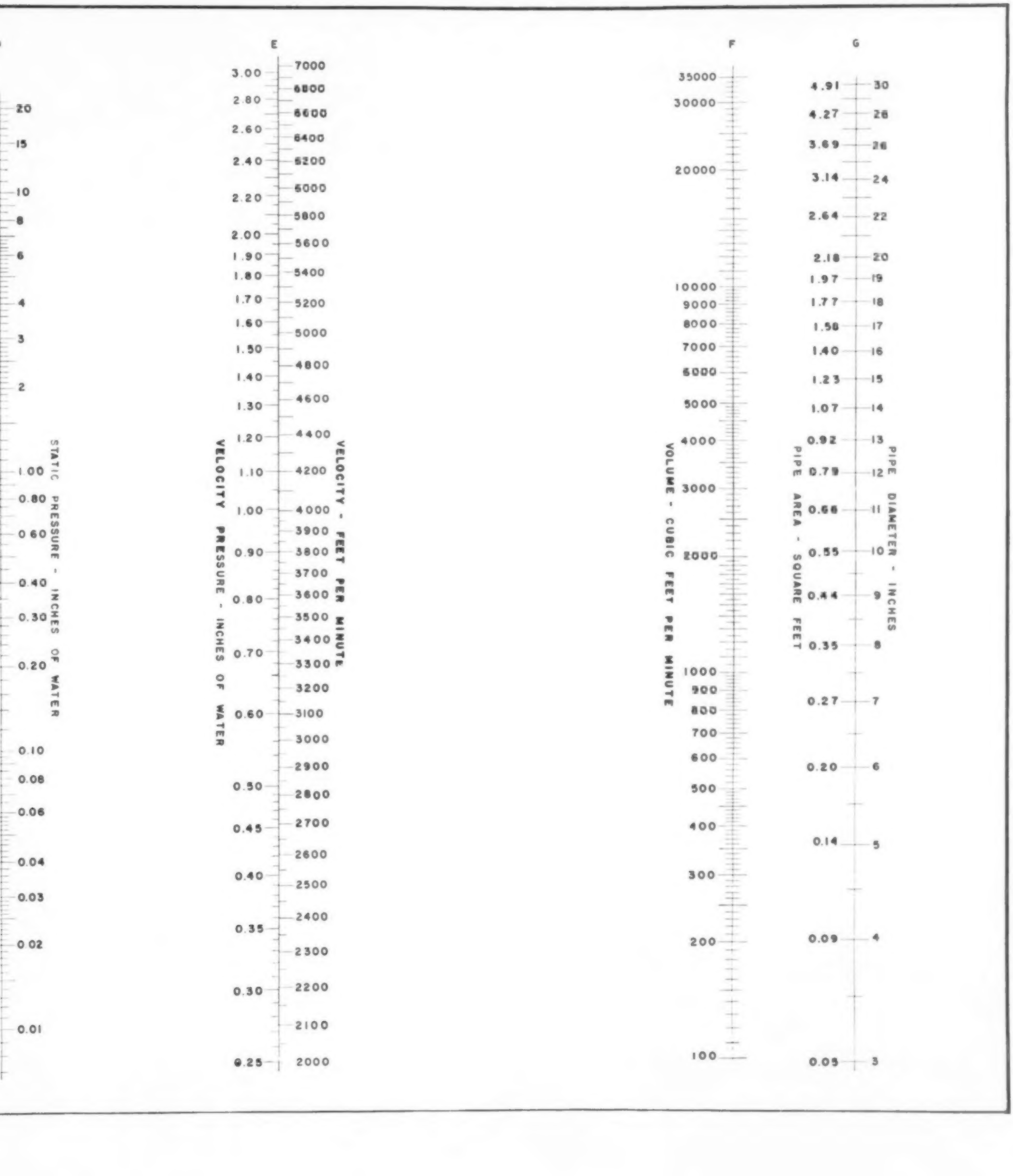
Step 1. The first thing to do is to find the hood or device which is the farthest away from the dust collector or fan. Using the nomograph this isn't absolutely necessary but makes the solution easier. In this case it is obviously the rotary table blast.

Step 2. Determine the amount of exhaust air needed and entry loss of the hood or equipment. In the case of the rotary table blast the exhaust air requirements depend on the application, the size of the machine, and the various components of the machine which all add together to form a unit. The data are available from the manufacturer of the equipment. For this problem we have assumed the total air requirements to be 5600 cfm and the pressure drop up to the point where all components come together to be 3.40 times the main branch velocity pressure. This value we place in the column labeled Equipment Loss.

Step 3. Next we determine the length of straight pipe required and the fittings. The pipe length is 12 ft. Since the type of dust carried by this section of the system is fine, we can obtain our pipe size by assuming a velocity of 3600 fpm which is in accord with the manufacturer's recommendations. Setting a straight edge on 3600 on the velocity scale *E* and on 5600 on the *F* scale, we find the required pipe size to be about 16.9 as noted on the *G* scale. Since this is an odd size we set the straight edge on 17 on the *G* scale, 5600 on the *F* scale and read 3570 fpm on the *E* scale. These final figures are then recorded on the calculation sheet. We find by observation that one elbow is needed, therefore we record 0.19 under elbows. This value was obtained from Table 2.

Step 4. Now we must find the pressure drop through the straight section of pipe. This is done by first de-


A
PIPE DIAMETER - INCHES
30
20
15
12
11
10
9
8
7
6
5
4
3
B
LENGTH IN PIPE DIAMETERS
500
400
300
200
150
125
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1.5
C
PRESSURE DROP - % VELOCITY PRESSURE X 0.01
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
D
STATIC PRESSURE - INCHES OF WATER
20
15
10
8
6
4
3
2
1.00
0.80
0.60
0.40
0.30
0.20
0.10
0.08
0.06
0.04
0.03
0.02
0.01
NOMOGRAPH
PRESSURE DROP CHART FOR
AIR 2000-7000 F.P.M.
W.W. DODGE



E
F
G
STATIC PRESSURE - INCHES OF WATER
VELOCITY PRESSURE - INCHES OF WATER
VELOCITY - FEET PER MINUTE
VOLUME - CUBIC FEET PER MINUTE
PIPE AREA - SQUARE FEET
PIPE DIAMETER - INCHES

termining how many pipe diameters of pipe we have. This is found by multiplying the number of feet of pipe by the number of diameters of pipe per foot. Thus

$$\frac{12}{17} \times 12 = 8.5$$ (all these figures are rounded off to the nearest ½ diameter)

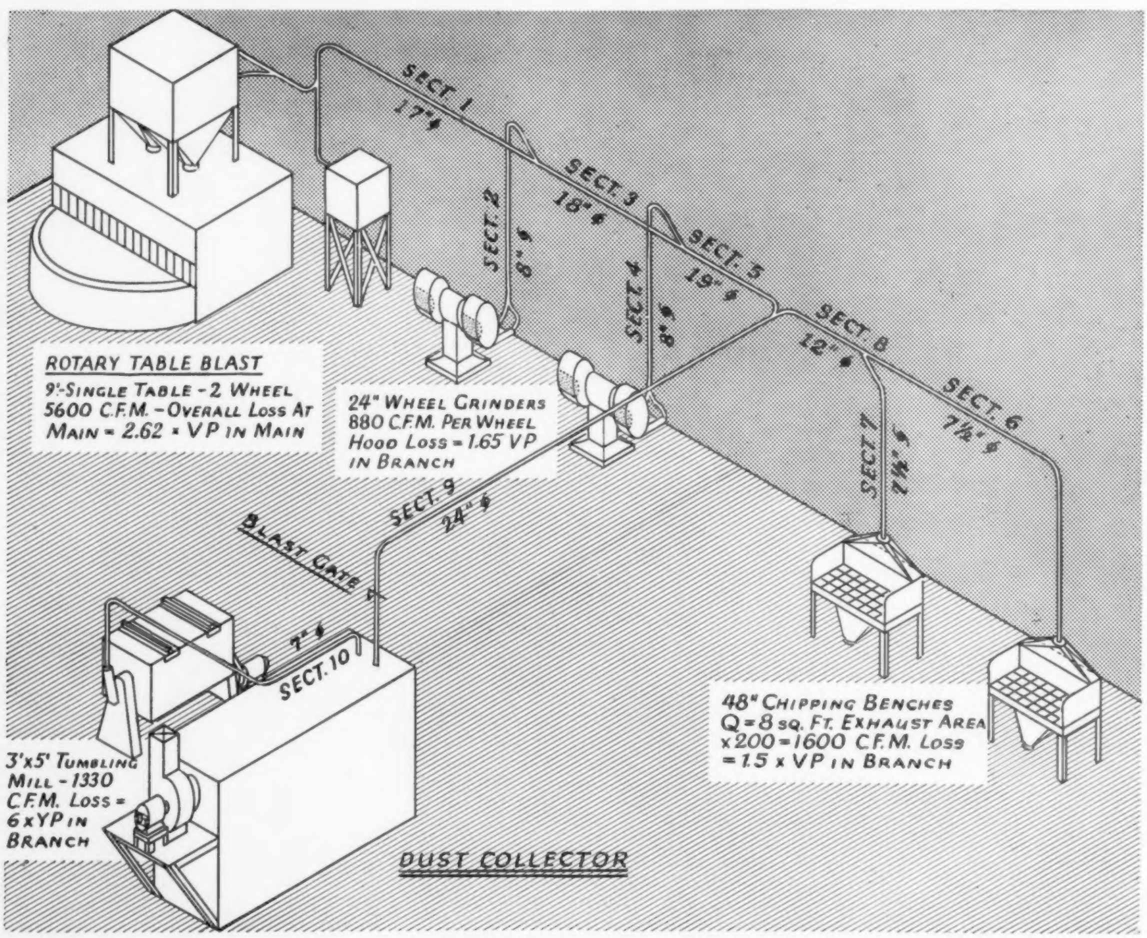
The pressure drop may now be found in terms of *velocity pressure* (VP) by laying the straight edge on 17 on pipe size scale *A*, 8.5 on scale *B*, and 0.142 is read on scale *C*. This is then recorded under Straight Pipe on the calculation sheet.

Step 5. Since we want to find total pressures, we enter 1.00 under the column Velocity Head. Now we can add all values and we find we have a pressure loss in this section of pipe of 4.73 VP. To determine the total pressure at this point, we lay the straight edge on 4.73 on the *C* scale and 3570 (the velocity in the pipe) on the *E* scale and read the pressure of 3.75 on the *D* scale.

Step 6. At this point we have a branch coming in from a stand grinder. Our aim will be to obtain a pipe size which will carry the volume of air required and which will have a pressure drop up to the main of exactly the magnitude of the main pressure at this point. First we record all fittings and equipment losses. We have allowed here for a 30-degree branch take-off with a value of 0.18, 0.19 for a 90-degree ell, and a value of 2.03 for equipment. The 2.03 is the summation of 1.65 for a stand grinder hood and 0.19 for each of two elbows which gives us the loss at the branch of the pipes from each wheel.

We know that for a hood with a lesser loss than preceding equipment and with a shorter run of branch pipe that we will have to have a relatively high velocity in this branch to build up a pressure to match that pressure drop accumulated to the branch point in the main. As a try, we see what size pipe would be needed to carry the required 1760 cfm at a velocity of 5000 fpm. An 8-in. pipe will do this so we record this size under Section 2 and determine that 7 ft of this pipe is equivalent to 10.5 diameters in length. Using scales *A*, *B*, and *C*, we determine the loss for this section of pipe to be 0.20 × VP. Recording the fitting losses of one elbow (0.19) and one 30-degree branch take-off (0.18) which totals 0.37, we now find we have a total loss in terms of velocity pressure of 2.61.

It will be noted that we did not add the 1.00 × VP to obtain total pressure under the column Velocity Head. This was omitted because the losses given



Exhaust system for sample calculations.

TABLE 1—EXHAUST SYSTEM CALCULATION SHEET

		Length		Resistance in Terms of Velocity Pressure							Vol. in CFM		Resistance, in. W.G.	
Sect. No.	Diam., in.	Ft.	Diam.	Straight Pipe	Elbows	Equip. Loss	Orifice Loss	Veloc. Head	Total	Veloc. FPM	Branch	Main	Branch	Main
1	17	12	8.5	0.142	0.19	3.40		1.00	4.73	3570	5600	5600	3.75	3.75
2	8	7	10.5	0.21	0.37	2.03			2.61	4790	1670		3.75	
3	18	8	5.5	0.091					0.091	4150		7270		3.85
4	8	7	10.5	0.21	0.37	2.03			2.61	4850	1870		3.85	
5	20	6	3.5	0.07	0.19				0.26	4220		9140		4.14
5	19	6	4.0	0.066	0.19				0.26	4680		9140		4.20
6	7.5	18	29	0.59	0.19	1.5			2.28	5230	1600	1600	3.9	3.90
7	7.5	8	13	0.26	0.37	1.5			2.13	5400	1650		3.9	
8	12	8	8	0.15	0.19				0.34	4150		3250		4.27
9	24	31	15.5	0.24	0.19				0.43	4150		12390		4.74
10	7	17	29	0.60	0.57	6		1.00	8.17	5000	1330			12.73
11	30	40	16	0.235					0.235	2810		13720		12.85

TABLE 2—STATIC PRESSURE OF ROUND ELBOWS EXPRESSED AS PROPORTION OF VELOCITY PRESSURE

Throat Radius in Pipe Diameters	90 deg	60 deg	30 deg
2	0.19	0.14	0.07
1	0.23	0.18	0.08
½	0.35	0.26	0.14

for most of the hoods shown in the manual are for total pressure and include this factor. Where values are not for total pressure, it is so stated with the data given. Since we know our total loss for the branch must equal the pressure in the main, we lay the straight edge across 2.61 on the *C* scale and 37.5 on the *D* scale and read the required velocity on the *E* scale which is 4790 fpm. We now determine from the *E*, *F*, and *G* scales that at this velocity our 8-in. pipe will carry 1670 cfm which we consider adequate for the stand grinder.

Step 7. The next section to consider is straight section No. 3, therefore we can select any velocity we choose and have only one loss to record and that is of the pipe alone. On the calculation sheet, we sum up all volumes handled to this point. This value is 7270 cfm; 4000 fpm is a good conveying velocity for the type of dust picked up so far. Therefore, by using the *E*, *F*, and *G* scales, we find that an 18-in. pipe will carry the volume of air needed at a velocity near 4000 fpm, viz., 4150 fpm. It will be noted that a 17-in. pipe would have carried it at about 4640 fpm which would be higher than needed, and a 19-in. pipe would have carried it at about 3750 fpm which is a little low—thus our choice of an 18-in. pipe. Now we find the number of pipe diameters involved by the same method illustrated before:

$$\frac{12}{18} \times 8 = 5.5 \text{ (rounded off)}$$

Using scales *A*, *B*, and *C* we find the loss to be 0.091 VP. Setting the straight edge on the pipe velocity of 4150 on the *E* scale and on 0.091 on the *C* scale, we read our loss of 0.10 on the *D* scale. This value we add to the main pressure to the last branch which was 3.75 and find we now have a total main pressure of 3.85.

Step 8. Section 4 is identical to Section 2, therefore it is safe to assume that the same size branch can be used knowing that slightly more air will be pulled through this branch due to the higher main pressure. The losses are all the same so we merely record in the columns for Section 4 the same values recorded for Section 2.

Knowing we must have a total loss of 3.85 and that this is equivalent to 2.61 VP, we find this branch velocity by laying the straight edge across 2.61 on the *C* scale and 3.85 on the *D* scale and read a velocity of 4850 on the *E* scale. Using scales *E*, *F*, and *G*, we find the volume of air to be 1870 cfm which we record.

Step 9. Section 5 is another main section in which we can select any velocity. Here again we use the *E*, *F*, and *G* scales to determine what pipe size will give us a velocity near 4000 fpm. Since it is more desirable to be slightly high than low, we choose a 20-in. pipe which will carry 9140 cfm at about 4220 fpm. Six feet of 20-in. pipe is equivalent to 3.5 diameters, the loss through which is 0.07 VP as determined by scales *A*, *B*, and *C*.

Since we branch at this point with another main into a 90-degree main, we allow a loss for one full elbow of 0.19. Our total loss then will be 0.26. At 4220 fpm this results in a total loss of 0.29 which we add to our last main value giving a total main pressure at this point of 4.14 in. water gauge.

Now we have to start calculations for another branch so we will leave a couple of rows on our calculation sheet blank in case we want to recalculate the last straight section of pipe to adjust pressures.

Step 10. Our next objective will be to design the main branch consisting of Sections 6, 7, and 8 in such a manner that its total pressure loss will equal that of the branch designed thus far. This part of the overall design probably requires more judgment than any other part of the design procedure.

To find a starting point we will first size a pipe for Section 6 that will give a pressure drop, which, when added to Section 8 with its very small loss, will balance the first branch. Since this branch is shorter, we'll try sizing it for 1600 cfm at about 5000 fpm and see what pressure is obtained. We find that a 7½-in. pipe conveys 1600 cfm at 5230 fpm so we'll try that size pipe. Eighteen feet of 7½-in. pipe is equal to 29 diameters. This we find from scales *A*, *B*, and *C* has a loss of 0.59, which, when added to a fitting loss of 0.19, and an equipment loss of 1.5, gives us a total of 2.28.

Using our known values of 5230 on the *E* scale and

2.28 × VP on the *C* scale we get a value of 3.9 on the *D* scale. This seems to be a reasonable figure since the difference in pressure between this point in the branch and the point where it intersects our first branch is 0.24. It is reasonable to assume we can do this.

Step 11. Now we must bring in Section 7 to match the pressure just calculated for in the main, which we found to be 3.9. We have allowed for a 30-degree branch take-off value in this branch of 0.18, a straight pipe value of 0.26, an equipment loss of 1.5 and 0.19 for an ell. We sized this one the same as the first branch since the only difference is the short run of straight pipe on the first branch. We find that a velocity of 5400 fpm will give us a loss of 3.90 when the equivalent loss in terms of VP is 2.13. This results in a flow of 1650 cfm which is satisfactory.

Step 12. In Section 8 we must find a pipe size which will give us the added loss of 0.24. First we select a pipe on the basis of the conveying velocity we have been using, viz., 4000 fpm. This we find is a 12-in. pipe which will carry 3250 cfm at 4150 fpm. We find loss in this pipe is 0.37 which added to 3.90 gives us 4.27. Since this is very close to our desired value of 4.14 we know that another pipe size will give us a value too low.

Rather than attempt to lower the pressure in this entire branch we will now go back to Section 5, increase its velocity and attempt to bring its pressure up to that of the branch we just calculated losses for. By reducing the pipe size in Section 5 to 19 in. we find we increase the velocity to 4680 fpm and obtain a loss of 4.20 in. which is only 0.07 in. less than the second main branch. This is considered close enough since in selecting a fan, interpolation in capacity tables to this order of accuracy is not necessary.

Step 13. Once again we select our main to the collector on about 4000 fpm. The resulting values are a 24-in. pipe with a flow of 12,390 cfm at a velocity of 4150 fpm. We find then that the collector pressure required for this branch is 4.74 in. tpwg.

Step 14. Calculating now for the tumbling mill we find that this line requires 12.73 in. total pressure. Since the wide range in branch pressures eliminates the possibility of balancing by pipe sizing, we must install either an orifice or preferably a blast gate, which in effect gives us an adjustable orifice, in the low pressure branch to create an additional pressure loss of 7.99 in. This is found by subtracting the pressure loss for the low pressure branch from the high.

Step 15. We must now assume a size for the pipe from the collector up through the roof or to the point of discharge to the atmosphere, wherever it might be. This velocity may be kept low and is usually determined by the size of the fan discharge. In this case we selected a 30-in. pipe which will have a velocity of 2810 fpm when conveying 13,720 cfm.

Step 16. Where the dust collector is not furnished with the fan, and the supplier does not allow for the pressure drop through the collector, this loss must be added to the total calculated pressure. We have assumed in this case that the collector manufacturer will furnish the air moving equipment and allow for the loss through his equipment.

Step 17. Our pressure drop calculations may now be given to the equipment manufacturer, care being taken to point out to him that our values are *total pressure*. If we are to select our own fan, we must be careful about subtracting values for velocity pressure to obtain static pressure.

Fan tables or treatises on the subject will advocate subtracting a value corresponding to the velocity on the discharge side of the fan, assuming it to be a recovery process. Where static pressure alone is calculated, it is assumed that the fan inlet velocity is equal to the inlet velocity at hoods which is seldom true in an exhaust system. Therefore, where we have a total pressure value for an exhaust system we may find the correct static pressure on which we can select a fan by subtracting the velocity pressure corresponding to the velocity at the discharge of the system to the atmosphere.

In this problem, let's see what the error would have been if we had not used total pressures. The error would have been a static pressure equivalent to the velocity pressure represented by the difference in velocity between our highest inlet velocity and our discharge velocity or:

$$5400 - 2830 = 2570 \text{ fpm}$$
$$\text{VP at } 2570 \text{ fpm} = 0.412$$

This is almost ½ in. which could result in a considerable difference in volume delivered by the fan. In some cases the trouble might be remedied easily, but to the owner's sorrow it might also require sufficient more power to demand a new motor of larger size.

Every care possible should be exercised in making exhaust system calculations so as to predict as nearly as possible the actual operating conditions.

Eight-Year Safety Record

Pipe Color Code Board shown here is one of the reasons why there has never been an accident due to mistaken identification of pipe lines or valves in eight years of operation at the Continuous-Cast Products Dept., American Smelting and Refining Co.

Harry W. Dietert / *Board Chairman, Harry W. Dietert Co., Detroit*

D Process for Precision Castings

Official exchange paper to the Institute of British Foundrymen from the American Foundrymen's Society, this paper—covering the philosophy of accurate, smooth castings and describing the author's process for making precision castings—was presented at the 51st annual I.B.F. meeting in Glasgow, Scotland, June 22-26.

■ Need for precise castings exists not so much due to their nice appearance as that they offer a means of reducing the number of machining operations. The cost of a part may be reduced by castings ready as near as possible to fit into a machine. Foundrymen should strive to make castings that are nearly finished and require the least amount of additional labor to complete the parts into finished items. Such castings are worth considerably more than inaccurate castings and they will increase foundry industry income. This amounts to an increase in sales and production volume without necessitating plant space expansion.

The precise casting offers many advantages, including the following:

1. Foundry operations such as cleaning, grinding, filing and salvage work can be reduced.

2. Precision casting molds are generally much lighter than conventional molds thus allowing for a reduction of manual effort.

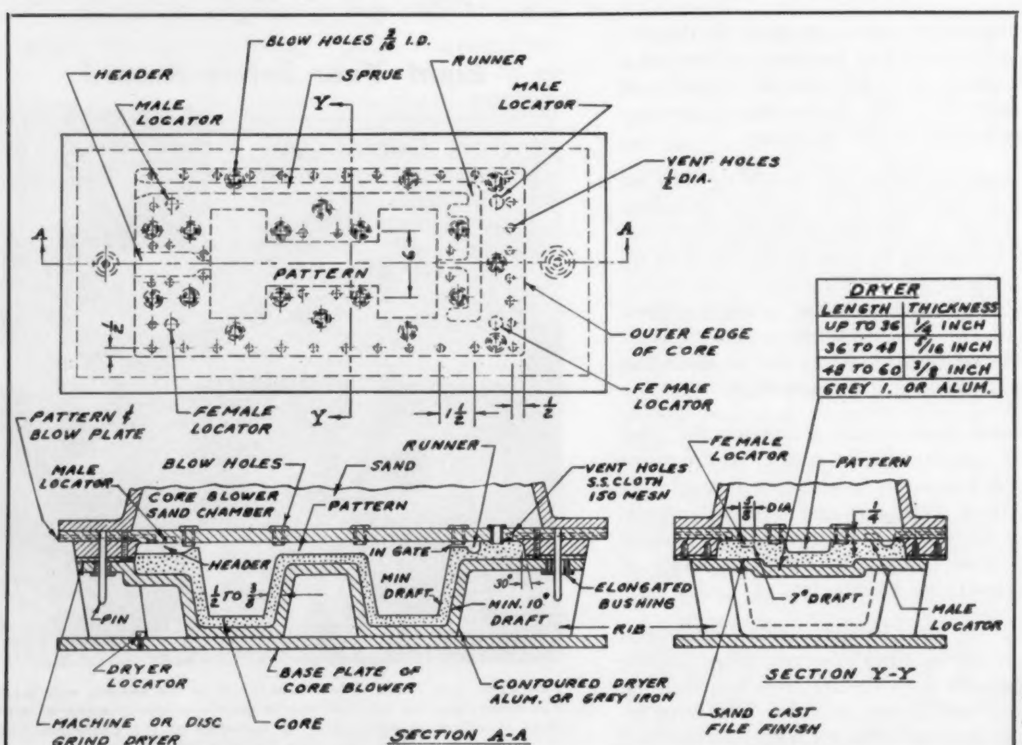


Fig. 1 — Pattern and drier assembly for D process.

3. They offer a means of materially reducing the dust problem in the foundry.

4. Precision casting methods allow for easy, condensed mechanization.

5. Casting finish is greatly improved thus making for greater customer appeal.

6. Weight of castings may be reduced by elimination of excessive finish for machining.

7. Accurate casting contour of precision castings makes for better fit into jigs, fixtures, and chucks. This eliminates off-center finished holes in the machined part.

8. Chucking operations may be speeded up due to the more accurate contour.

9. There is lower tool breakage due to more accurate chucking.

10. Turning, broaching, and boring operations may be eliminated by using only a grinding operation to finish the precise cast surface for an accurate wear surface.

11. Finish for turning, broaching, and boring may be eliminated.

Why Wait and Go Slow

These attributes of precision castings may paint an irresistible picture to too many foundrymen. The question naturally arises: If a precision casting will do all of that, why wait and go slow? Some of the problems facing the precision casting field are:

1. Precision casting methods are still in a rapid development stage. Necessary equipment may be obsolete in a comparatively short time.

2. Precision casting methods available at the present time are mainly for small castings weighing, for example, under 25 lb. Several operations are in production where precision castings up to some 200 lb are made which require very little working to finish the part. It may not be possible to find sufficient tonnage to pay for the investment.

3. Much research work is still necessary to enable specified now or that will be specified in the future. the foundry to hold tolerances on cast parts that are

Principle. The precision casting field requires of foundrymen much in the way of accepting and learning new techniques. Fortunately, however, these new techniques follow the general teaching of the green and dry sand foundry. Three basic principles are in use in making the present day precision castings.

First: Use a mold of very high hardness which will support a molten metal load without deforming.

Second: Use a very fine-grained molding material that will give a fine, smooth finish.

Third: Use a mold material of controlled collapsibility and thermal volume.

High mold hardness is obtained either by baking or firing the mold which contains bond or bonds that bake or fire hard. Fine-grained molding material is used either as a relatively thin coat on the metal-mold interface or it is used throughout the depth of the mold. The permeability for venting the mold or mold face is secured because the coat of fine material is thin. The thinner the coat the higher the permeability. Thin molds of fine grains possess ample permeability due to their thinness. When an entire deep mold is made from relatively fine-grained material, the gas content of the molding material is kept at a minimum so that a low permeability material may be used.

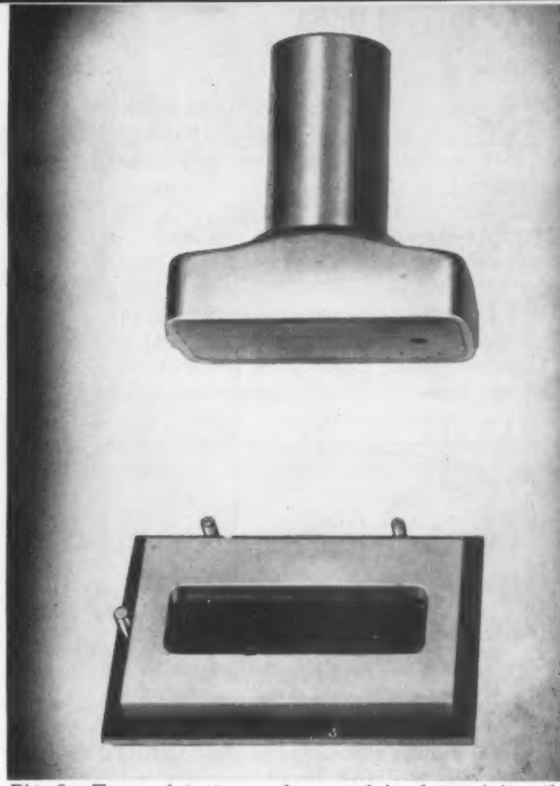


Fig. 2—Type of test core box used in determining the blowability of core binders.

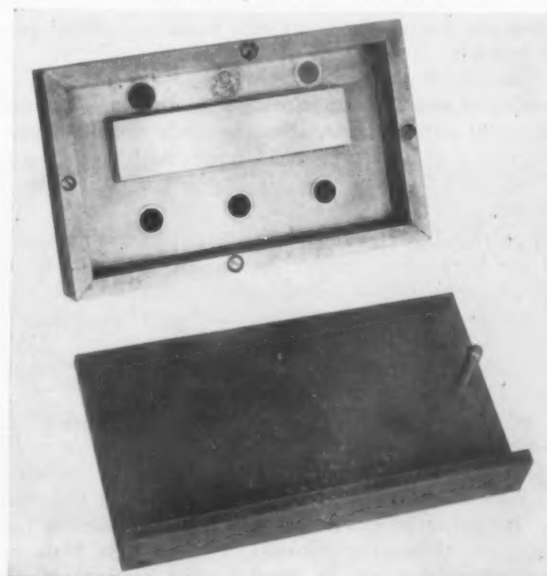


Fig. 3—Type of test core box used in determining the stickiness of core binders.

Molding materials used in some precision casting methods are compounded to give a predetermined expansion-contraction upon heating. The rate at which the bond in the molding material collapses at elevated temperature is often controlled. In shell molds, the rate of collapsibility is retarded by choice of bonds or an additive.

Patterns. Types of patterns used in the precision casting field are: (1) wax pattern, (2) frozen mercury pattern, (3) hot metal pattern, (4) cold metal pat-

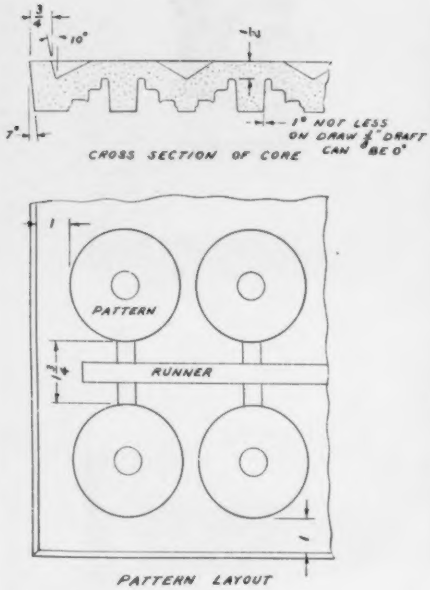


Fig. 4—Pattern layout for D process.

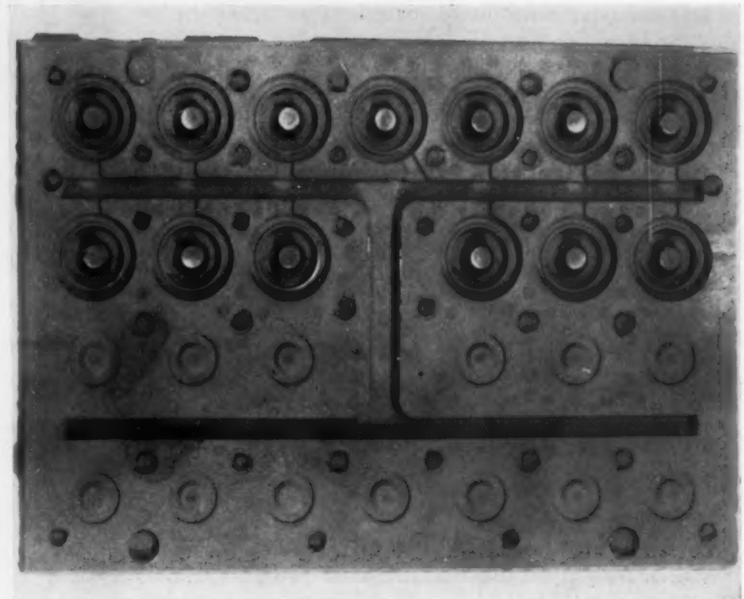


Fig. 5—D process core with cope and drag on one plate.

tern, (5) rubber pattern, and (6) machined cavity.

Both the wax and frozen mercury patterns allow for very intricate designs of the part since they are removed by heating the completed mold. These patterns are formed in accurately machined metal pattern molds.

The metal pattern, whether used hot or cold, is machined to an accuracy of ± 0.001 in. and mounted on metal pattern plate. Patterns made of rubber may be employed to form mold cavities with back draft. Molds in which the pattern impression is machined in the mold are also in use.

Precision Casting Methods. As a foundation for study of the D process, it is well to briefly review some of the general methods of making precision castings. The principle ones are: (1) investment process, (2) shell mold, C or D, (3) carbon mold, (4) ceramic mold, (5) plaster of Paris mold, (6) precise dry sand mold, and (7) high pressure molding.

The investment process, sometimes referred to as the lost wax process, employs a very fine-grained mold coating backed up by a relatively high permeability backing material. The pattern is wax and removed upon mold baking. The mold material generally has a chosen thermal expansion. This process finds its greatest application in small precise castings of all metals. Many small castings are made in production lots with a normal tolerance of 0.005 in./in. and a 50 RMS surface finish.

The shell mold, whether made by the Croning or the Dietert process, employs a metal pattern. The C process uses a hot pattern while the D process uses a cold pattern. Both processes obtain a high permeability with fine-grained silica sand by using a thin mold. While in the C process the shell is formed over the hot pattern by gravity flow of the sand and resin binder that softens on heating, the D process uses a core blower to form the shell. The shell is baked in both processes and shells are held together with shot or other devices in the C process and with mechanical clamps in the case of the D process. Castings with a tolerance of 0.005 in./in. are in production. Surface finishes down to 50 RMS are possible in regular production.

The carbon mold process will be designated as the G process in honor of the Griffin Car Wheel Co., which developed this process to a high plane. In the G process, two permeable synthetic carbon blocks are machined to form the pattern impression in the mold. The mold cavity is coated with a silica-base wash after each casting. Steel car wheel castings weighing 1000 lb with a tolerance of 0.020 in. are in production. After 150 castings, the mold is refinished.

Precision casting molds are also made of a fine ceramic grain bonded with a chemical. This process has been developed to a good production state by Michigan Steel Casting Co. Mold material, as in the case of the traditional investment process, is a slurry and is poured over a wax pattern. The mold is fired at a low temperature causing the wax to flow out of the cavity and setting the chemical bond in the molding material. This process finds good application in making intricate high-alloy castings heavier than those made in the investment process.

A recent British development is the Shaw process (*"Investment Precision Casting Without Expendable Patterns,"* A. Dunlop, American Foundryman, June 1954, pp. 64-69). Though it follows the usual investment process steps in large part, a special gelling reagent gives the mold a rubber consistency shortly after pouring the slurry. This makes removal from solid, intricate patterns possible without disposal of the pattern.

The plaster of Paris precision casting method employs a metal pattern over which a slurry of special plaster is poured. The mold is thick but dried plaster molds possess ample permeability. This method is used in production particularly for aluminum castings of good accuracy and finish. The usual precision casting tolerances are obtainable.

The precise dry sand mold method is one employed

mainly by the American Brake Shoe Co. for castings of a wide range of applications with exact surface contour and excellent finish. In this method, precision practice prevails in all phases of equipment and molding. It shows what can be done to perfect the usual foundry operations.

High pressure molding employs a cold metal pattern, strong flasks, and silica sand bonded with hydrocarbon resin and bentonite. Molds are squeezed with pressures up to 450 psi. This method is advancing under the guidance of Norman J. Dunbeck, Eastern Clay Products Dept., International Minerals & Chemicals Corp.; both gray iron and brass castings are on experimental runs. Like other precision casting methods, this process produces castings with considerable customer appeal.

D Process. The author started intensive research work on the D process in 1952, the motivating force being the belief that a good shell mold could be blown with a conventional core blower. If this were possible, a large selection of binders such as oil, resin, and cereal could undoubtedly be developed that would produce shell molds at low cost. The shell molds were to be baked rapidly in conventional core ovens and the shell molds held together rigidly by means of mechanical clamps. The latter is easy since the back of a blown D shell is smooth and hard.

Early in 1953 the author secured assistance from L. P. Robinson and O. J. Myers, Foundry Products Div., Archer-Daniels-Midland Co., in providing various binders for the experimental work. Shortly thereafter Wm. G. Ferrell, Auto Specialties Mfg. Co., made the first D process runs in a foundry casting experimental automobile crank shafts and is now ready for production. With the valuable aid received from these co-workers, it was definitely shown that the D process was practical and apparently had merit.

During the latter part of 1953, J. O. Ostergren, Lakey Foundry Co., made pattern equipment and rigging for the D process to cast three different small compressor parts in iron. This pattern equipment went into production in the early part of 1954, producing several hundred thousand precision castings. Another co-worker who has done a great deal of research on D process binder is Wayne Buell, Aristo Corp.

(Editor's Note: Patent applications covering the D process have been entered by the author in the United States, England, Germany, France, and Italy. The plan is not to charge any foundry royalty, unless it desires a personal license, but to grant any manufacturer of binder made for use with the D process, the right to permit its foundry customers to freely use its binder with the D process. The binder manufacturer will be charged a small royalty for use of its binder with the D process in hope that the large expenditures in time and money in developing the D process will be repaid and that funds will also become available to help pay for continued research on this or other processes which may further the casting industry.)

D Method. The D process used today employs an accurately machined metal pattern mounted with gates on a metal blow plate which in turn is bolted to the blow chamber of a core blower. A hot or warm metal drier which is contoured around the pattern surface leaving a small space, usually 3/8 in., for the core sand is placed under the pattern (Fig. 1). The two are clamped together by the core blower and the core sand is blown through blow holes in the pattern plate into the space between the pattern and drier. The pattern is cold though the drier is not. The drier with the blown shell mold is placed in the core oven and baked. After baking, the core is removed and two such cores are clamped together to form a rigid mold. Molds are poured either vertically or horizontally, allowed to cool from one half to three minutes, and the casting is removed. The burnt sand may be reclaimed.

An alternate method is to have the core box down and to blow the sand through a contoured plate which

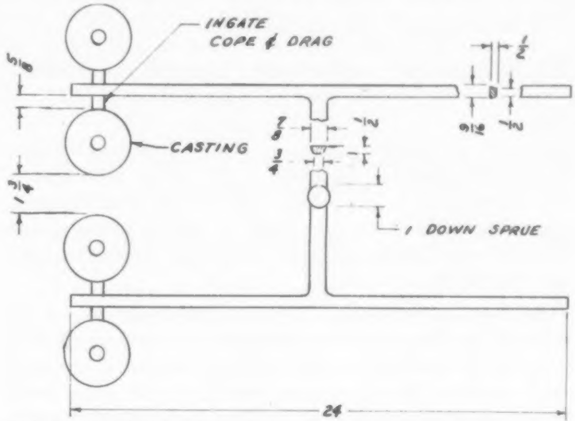


Fig. 6—Typical gating arrangement for D process pattern designed for horizontal pouring.

AUTO SPECIALTIES MFG. CO.

Fig. 7—D process gating arrangement utilizing bottom ingate for vertical pouring.

is mounted on the blow chamber of the core blower. The blow holes and vents are placed in the contoured plate forming the back of the blown shell. This contoured plate is operated at or near room temperature while the core box is heated to the baking temperature of the core binder employed.

Sand. A fairly wide range of sand may be used for the D process, ranging from 90 to 150 AFS fineness number. The clay content should be less than 0.3 per cent AFS clay substance. Either washed and dried sands or bank sands, carefully graded to remove any coarse grain and foreign material such as roots, leaves,

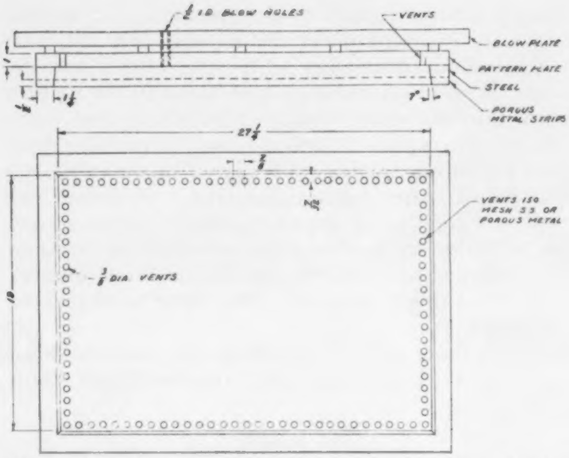


Fig. 8—Drawing of method used for venting the perimeter and border strip of pattern plate.

etc., may be used. Fineness of some of the shell sands in use are tabulated in Table 1. The bank sand shown in Table 1 is a low-priced, dried and graded bank sand mined in Michigan. Price at the shipping point of sands used range from $2.85 per ton by the carload up to $12.00 per ton.

Binders. At present, binders for D process cores are mainly special core oils. One plant is using oil and dextrin. Increasing interest is being shown in blowing shell molds with resin-bonded sands. For this, the sand is precoated with resin so that no loose, dusty binder is present. Each grain is coated with a thin film of resin; binder requirement is reduced to only several per cent.

Two Processes Are in Use

Two processes for precoating sand are in use—the hot and the cold. The cold process employs a liquid resin and catalyst which are added to the sand at room temperature in a standard muller. The hot process requires heating the sand to 600-700 F, then addition of a dry, powdered resin, followed by mulling. The resin softens due to the heat, the sand grains are coated, then a liquid catalyst is added. The sand is immediately discharged into a cool sand mixer and further mixed to break up any lumps.

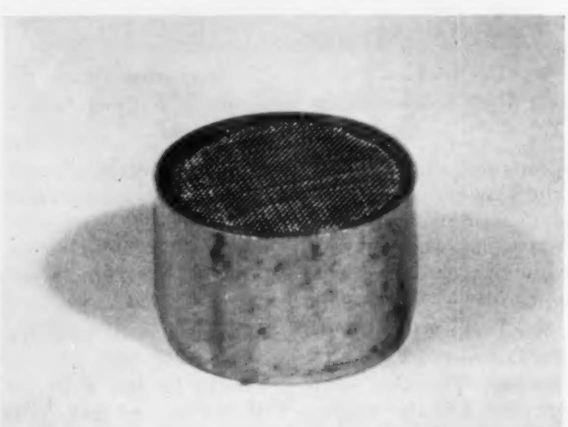


Fig. 9—Stainless steel vent, 150-mesh.

Thus, bonds for the D process may be divided into three groups:

1. D process oil without water.
2. D process oil plus cereal plus water.
3. Resin plus liquid, either hot or cold precoated sand.

The first group uses a dry material to retard sticking. The dry sand and oil are mixed together in a conventional sand mixer for at least three minutes. Then a dry material is added which covers the oil layer around each sand grain with a dry coating. The core sand mix loses its oily and sticky feel, thus eliminating sticking tendency. Some formulas for this type of mix are:

A.	Shell Bank Sand	96.5%
	D Process Oil	2.0%
	Naval Stores Resin	1.5%
B.	Shell Bank Sand	97.5%
	D Process Oil	2.0%
	Powdered Hydrocarbon	0.5%
C.	Shell Bank Sand	95.5%
	D Process Oil	2.5%
	Fine Grade E Seacoal	2.0%
D.	Shell Bank Sand	91.5%
	D Process Oil	2.5%
	Fly Ash	6.0%
E.	Shell Bank Sand	95.5%
	D Process Oil	2.5%
	Iron Oxide	2.0%

D process cores made with oil, cereal, and water which are used successfully for casting gears may have the formula:

F.	Shell Sand	98.0%
	D Process Oil	1.0%
	Dextrin	1.0%
	Water	2.5%

Typical formula for shells made of precoated, resin-bonded sands is:

G.	Precoated Shell Sand	99.0%
	Kerosene	1.0%

TABLE 1—FINENESS OF SOME SANDS FOR THE D PROCESS

Sieve No.	Illinois Sand	New York Sand	Penn. Sand	Mich. Sand	New York Sand	Mo. Sand
6	—	—	—	—	—	—
12	—	—	—	—	—	—
20	—	Trace	—	—	—	—
30	Trace	0.2	0.1	—	—	—
40	Trace	0.4	Trace	0.2	0.1	0.1
50	0.2	3.7	1.4	1.2	0.6	0.9
70	0.3	13.2	9.1	3.6	3.9	8.3
100	7.7	23.3	19.4	17.9	13.4	37.3
140	38.4	20.2	21.9	35.5	22.9	33.2
200	33.6	17.8	25.2	32.7	26.1	15.7
270	13.2	8.6	12.2	6.9	14.5	3.0
Pan	6.6	12.4	11.1	1.5	17.9	1.2
AFS fineness	133.3	124	123	115	153	95.8
AFS clay, %	0	0.2	0	0.5	0.6	0.3

Fig. 10—Typical powdered metal vent.

Mechanical properties of cores for the D process shell are extremely important.

First, the mix must possess high blowability—at least 65 per cent, where blowability is expressed by the ratio of green hardness of a blown test core (Fig. 2) over green hardness of an AFS rammed 2 x 2 in. core specimen. High blowability is necessary to be able to readily blow a thin core.

A second mechanical property is minimum stickiness. Stickiness is measured by determining the number of cores that may be blown without any sand sticking to the surface of test core box (Fig. 3). At least 15 boxes should be blown before a single sand grain begins to adhere to the test core box surface. Drying up the oil binder with a dry material such as fly ash, naval stores resin, seacoal, powdered hydrocarbon resin, or iron oxide has proved most helpful.

Green Strength Is Necessary

A third mechanical property that is necessary is green strength. The green strength in a D process core mix is largely obtained by compactness of the relatively fine grain structure and the fine dry material added such as naval stores resin. To obtain green strength of the core in the drier, it is necessary to obtain a firmly blown core. A soft core has low green strength. A heavy-bodied core oil is a means of obtaining green strength. However, such oils are slow in mixing and difficult to handle in cold weather.

A green strength from 0.5 to 0.7 psi is readily obtained from sand mixes *A* to *D* inclusive. Sand mix *E* may be expected to give 0.4 psi green strength. A green strength in this range will usually handle the general run of cores. Bench life should be at least three hours without excessive crustation.

A ¼-in. thick AFS tensile core specimen when baked at 425 to 500 F in an AFS specification core oven for 20 minutes should produce a strength of at least 200 psi. The binder, in case of oil, should be all drying oil and not compounded with oils or materials that will not add to the strength of the baked core. The baked tensile strength of a D process core should be over 200 psi with a dry hardness of 90 plus.

The mix should be so compounded that the D process shell will not collapse before the casting is solidified. Rate of collapsibility for a light casting with metal thickness averaging ½-in. should be about

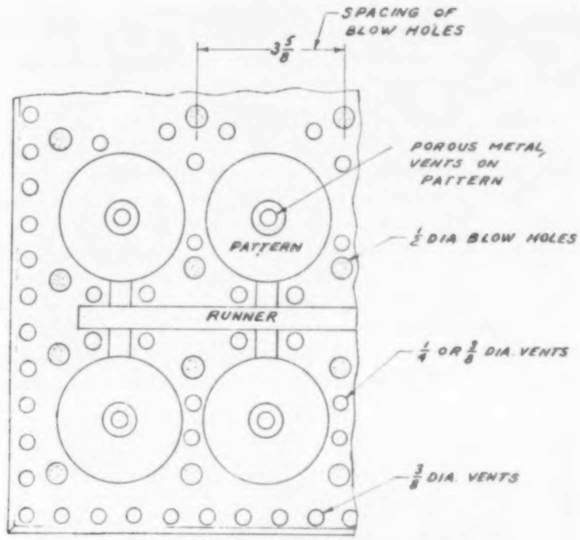


Fig. 11—Illustration of spacing of vents and blow holes around pattern in D process.

400 seconds. Cores for castings with 2-in. sections should not collapse before 600 seconds.

Collapsibility is measured on a 1⅛-in. diameter test core 2 in. in length, AFS rammed and baked the same as production cores, cooled and then inserted in high temperature test equipment at 2000 F. Length of time that the test core will support a 50-psi load at 2000 F is determined. Materials such as iron oxide, seacoal, pitch, fly ash and silica flour increases collapsing time.

Patterns. Much of the success of any precision casting method depends upon the accuracy of the metal pattern. The pattern must be well designed, rigid, and smooth to 10 RMS and the dimensions held to ± 0.001 in. with complete absence of any tool marks or other blemishes. The metal pattern should be mounted on a steel pattern plate at least 1 in. thick.

Patterns may come within 1 in. of the outer perimeter of the D process shell (Fig. 4). It has been found that 1 in. will seal the outer perimeter of a shell for horizontal pouring. In case of vertical pouring, it is well to allow a ¼-in. seal. Good practice is to allow a ¾-in. space between patterns. Space of 1¾ to 2 in. is sufficient for a runner between two patterns as shown in Fig. 4. Each pattern must be firmly fastened to the pattern plate making a fine line contact with the plate at all points. Draft, when necessary, may be zero providing height of pattern does not exceed 1 in. Normal draft such as two degrees is preferred. Drafts of ½ and zero are being used for light castings on exterior portions of the pattern.

Steel Border Around Perimeter

A general pattern layout and assembly is shown in Fig. 1. Note that around the perimeter of the pattern plate is a steel border the same height as the thickness of the D process core. Draft on this border should be not less than 30 degrees. Stripping pins should be provided on each end of the pattern plate to accurately guide the drier from the pattern in stripping. Every effort should be made to insure that one pattern plate

will form both the cope and the drag portion as shown in Fig. 5. The top two rows of patterns form half of a bearing plate while the lower two rows form the other half of the bearing plate.

Gating. The gating of D process patterns for horizontal pouring is shown in Fig. 6. Gates and runners are generally smaller than green and dry sand practice. A runner pattern $\frac{7}{8}$ to 1 in. at the plate and $\frac{3}{4}$ to $\frac{7}{8}$-in. on top is adequate for runners up to 15 in. in length. The over-all height of the runner in the D process mold is 1 to $1\frac{1}{8}$-in. feeding up to 40 castings in one mold. Such runners must be machined over all and form a surface that will promote easy lifting. The sprue for horizontal pouring may be 1 to $1\frac{1}{4}$ in. in diameter and should be provided with a pouring basin 3 to 4 in. in diameter.

WM. DEMMLER & BROS.

In vertical mold pouring, the casting is generally larger and the sprue with horizontal runner will measure $1\frac{1}{4}$ in. in diameter (Fig. 7).

Venting. A new venting practice was necessary to secure a firmly blown D process core. The first principle to accept is that the core must be blown quickly —like a flash of lightning. Pattern wear is greatly reduced and a hard core is obtained. To accomplish this, one must follow an over-venting practice. The first step is to vent the pattern plate perimeter and pattern plate border, as illustrated in Fig. 8. Around the outer edge of the pattern plate and through the border plate, drill holes for vents $\frac{7}{8}$ in. apart. Use D process vents $\frac{3}{8}$ in. in diameter and make certain that they are smooth on top and flush with plate surface to avoid sand sticking.

Two types of vents are in use. One is a stainless steel wire screen of 150 mesh as shown in Fig. 9. The other is a powdered metal disc vent as shown in Fig. 10. A fine screen such as 150 mesh is necessary to avoid plugging with the fine sand used. The stainless steel is hard and makes for a flat surface. The powdered metal vent is mounted in a brass ferrule the same as the regular vent. The powdered metal vent has the advantage that sand will not stick to it and the top surface may be smoother than a screen. Venting of a powdered metal vent is lower than that of a screen, but it may be placed on a pattern surface, if necessary, without leaving a scar. This vent was developed by Alex Graham, Dietert Co. research director.

Figure 11 shows the spacing of vents around the pattern. Vents should be placed around the perimeter of each pattern and at each runner corner or pocket. It is a good rule to place a vent every two or three inches around a pattern. All pockets in patterns must be vented to allow air to escape.

Blow Holes. Here again one must accept the fast blow principle. This means ample blow holes. At present it seems desirable to employ a large number

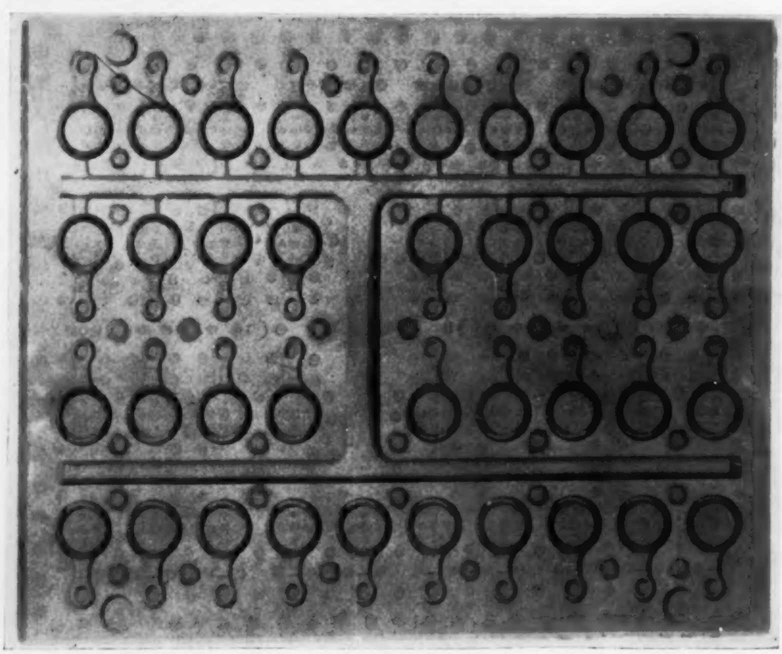


Fig. 12 (left above)—Core blower of type used for blowing D process cores.

Fig. 13 (left)—D process drag core, showing locators in each corner.

of conservatively sized blow holes in preference to a small number of large blow holes. Steel or rubber-lined blow holes ½ to ¾ in. in diameter have worked well. Spacing blow holes every three to four inches around the pattern is in use as shown in Fig. 11. The blow hole should project ⅛ in. beyond the face of the pattern plate so that at each blow hole there is a depression and not a projection to interfere with the mating of cores.

Locators. Two male and two female locator points placed in each corner of a D process core are used in cases where one plate makes both halves of a casting (Fig. 5). When two plates are used—one a cope and the other a drag—plates are also provided with locator projections and depressions (Fig. 13).

The locators are usually ½ in. in height with bottom diameter of ¾ in. and top diameter of ⅝ in. Should a minimum of core binder be used in the core mix, it is advisable to add a drop of core oil on each locator point before baking.

Drier. Purpose of the drier is to form the back of the D process mold. The drier is contoured around the pattern so as to form a space into which core sand may be blown. Figure 1, which gives details of a pattern assembly and drier, shows the drier under the pattern. However, one can reverse this and blow through a drier with blow holes extending through the drier. This slows production and is not in use.

The drier may be gray iron or aluminum, the former allowing for higher baking temperatures such as 500 F. The design of the drier must receive careful study so as to have driers that will not break or warp out of shape. This calls for ribs of ample depth and size. Actual thickness of the drier body need not exceed ¼ in. The outer edge or perimeter and pin lugs must be strong. For example, make the outer edge ½ to ⅝ in. thick or run a rib around the outer edge and fit the interior of the drier with crossed ribs every four inches.

Driers are cast and the interior surface should have a draft not less than 5 degrees. The interior surface of the drier is not machined—a good cast surface suffices. The face of the drier is disc ground or machined to a flat plane. Warp of 1/32 in. is permissible. The bottom of the drier rib structure is disc ground. A round hardened pin bushing is inserted in one end of the drier and an oblong one in the other end to receive the two stripping pins. The number of driers required presents a problem. A set-up for blowing 250 cores an hour, using a fast-baking oil, requires 125 driers, cycling driers at 30 minutes each.

For accurate castings and to keep driers from tearing cores or producing a hairline crack in a core during baking, it is necessary to blow into warm or hot driers. No parting material is used on the drier. On new driers, machine oil may be used as a coating, followed by baking to secure a carbon coating.

When resin-bonded sands are used, it is advantageous to bake the core in a hot core box. This calls for mounting a contoured plate, which forms the back of the shell, on the blow plate of the core blower. The core box may be heated by thermostatically controlled resistance heaters. After the core is blown, the core box is placed under any form of heater to bake the core.

FRENCH & HECHT DIV., KELSEY-HAYES WHEEL CO.

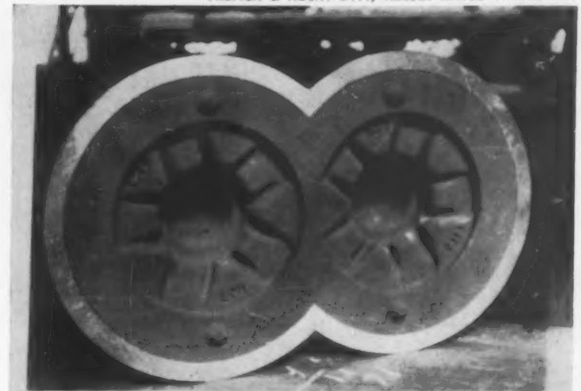


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Fig. 14 (above)—Blown D process core shown in place in drier. Fig. 15 (below)—Rear view of a D process core for casting a crank shaft.

Blowing. Any conventional core blower will make D process cores providing it is equipped with a bottom air cylinder for drawing the drier from the pattern. The draw mechanism should be in good repair. Accuracy of draw is secured by means of stripping pins. A moderate sized air vibrator should be attached to the pattern plate. A blower equipped with air reservoirs and capable of blowing D cores up to 40 x 27 in. is shown in Fig. 12. It has a stationary sand chamber and a long, large draw cylinder making for accurate line up between plate and drawing table.

Lowest production costs are obtained when cores of relatively large area are used. For blowing cores measuring, for example, 24 x 36 in. core blowers are equipped with large clamping cylinders of, say, 28 in. in diameter.

Air pressures from 80 to 100 psi are in use. Speed of drawing the drier from the pattern should be slow at the start, then faster to complete the draw. Large cores are cycled at 13 seconds through the blower. The operation lends itself to automation which fits into modern foundry trends. Driers may be fed into and removed from the core blower by air cylinders.

The pattern surface is cleansed with a liquid found best for each particular type of core binder. No parting material is placed on the pattern surface. However, the pattern surface must be cleansed with liquid solvent, for example, methylene chloride.

A blown core in a drier for a wheel hub is shown

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Fig. 16 (left)—Special core blowing machine designed for blowing shell molds. Blower has transfer table for automatically feeding electrically-heated core box into blower unit, placing in baking position, finally in stripping position.

in Fig. 14. Figures 7 and 15 show a core for a crank shaft. A drag core for production of small connecting rods is shown in Fig 13.

As indicated previously, when blowing into a hot core box, the back of the core is formed by a contoured plate mounted on the blow chamber of any conventional or special core blower. Vents and blow holes are located in this plate. The hot core box contains the patter or patterns with the gating system. This method uses resin-bonded sand, preferably the precoated type.

A special core blower designed for blowing shell molds is shown in Fig. 16. This blower has a transfer table which automatically feeds the electrically heated core box into the blower unit, then transfers it to the baking position, and next to the stripping position where pusher pins lift the baked shell away from the hot core box.

Clamping. Two D process cores are placed together without any cement in a mechanical clamping device. This holds the two cores together firmly to prevent a run-out or any warping which would result in a distorted casting.

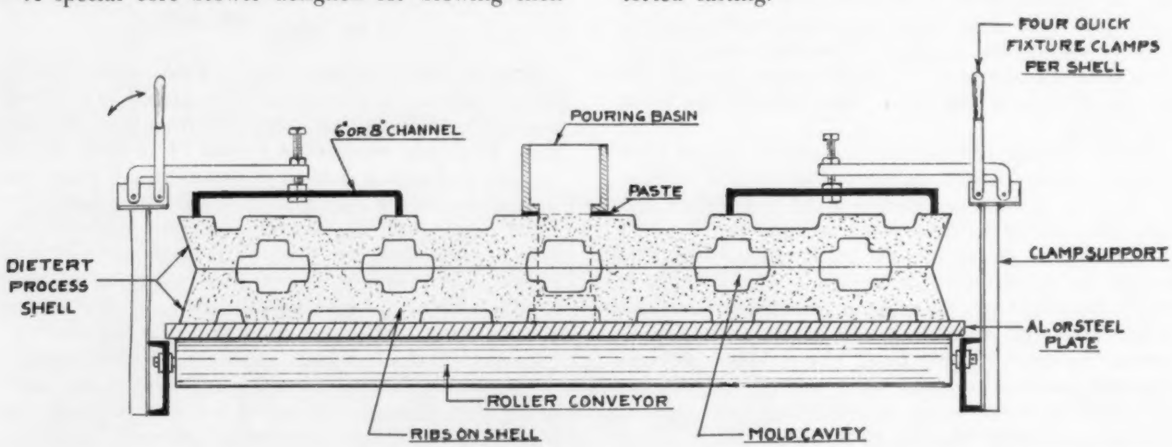

Fig. 17 (above)—Fixture clamping device for horizontal pouring.

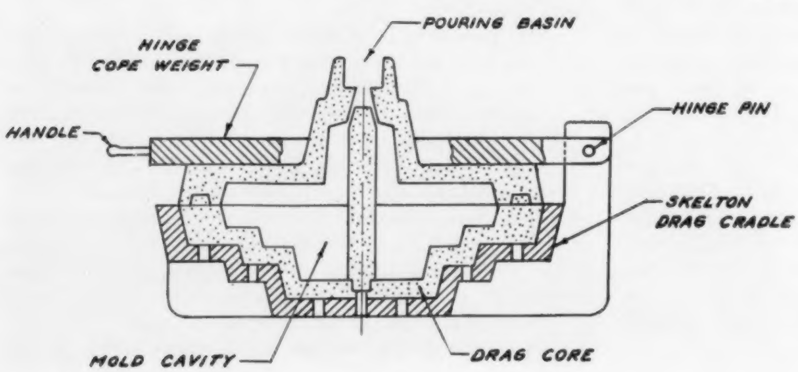

Fig. 18—Dead-weight clamping device used for horizontal pouring.

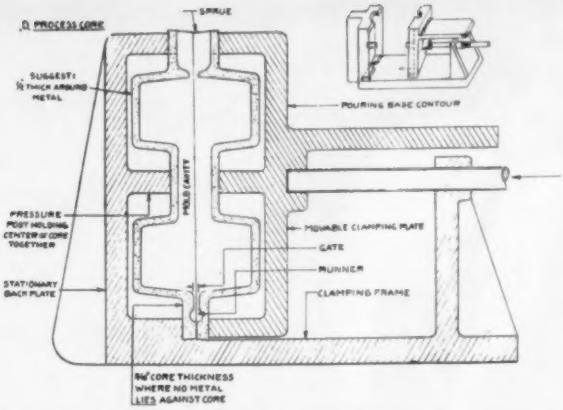

Fig. 19—Pneumatic-loaded clamp for vertical pouring.

A simple clamping mechanism, which is proving to be successful at Lakey Foundry Co. is shown in Fig. 17. The assembled cores are placed on an aluminum plate and are pushed into pouring position. At this location are four fixture clamps for each mold. Each fixture clamp is attached to the frame of the roller conveyor. On the clamping arm of the fixture clamp is a length of channel beam. When the fixture clamp lever is pressed into clamping position the channel beam presses each corner section of the core down firmly and in a flat plane against the bottom plate.

Another clamping device for a D process core is shown in Fig. 18. The drag core is set into a skeleton cradle that rests on a conveyor table. The mold is then assembled and the top weight is swung onto the core, firmly holding it in position ready for pouring. When molds are poured vertically, a movable cradle striking the molds at numerous places presses the assembled mold against a stationary cradle (Fig. 19).

D Process Castings. The surface finish of castings made in the D process depends largely on the fineness of the core sand employed. Dimensional tolerance is in the order of 0.005 in. per linear inch which is the usual accuracy expressed for other precision casting methods. Possible degree of accuracy varies with the foundry and the casting design.

The surface finish of precision castings should be specified in RMS. The root mean square method is used in expressing machined surface smoothness. Foundrymen are encouraged to make use of this method for expressing the finish of castings.

In the casting field, it is suggested that a maximum RMS be used to express the greatest roughness that can be allowed in any small area with another RMS to express the smoothness of the majority of the casting surface.

Conclusion. The number of castings that will be made by precision casting methods will steadily increase. A general increasing demand for the precision type of castings is evident and foundries which have a precision casting department will undoubtedly see that department grow. Foundries which do not enter this field, providing they make castings that can be made at a lower total cost by precision methods, will lose business.

The author's energies were directed into this field with the feeling that he could be of service to his chosen industry. He hopes this work will prove beneficial to the foundry either by being directly of use or by leading the way to another better method.

Calendar of Future Meetings and Exhibits

August

9-11 . . Dietert Sand School.
Engineering Society of Detroit, Detroit.

9-14 . . Short Course: Cast Metals in Engineering Design—Fundamentals
Cast Metals Laboratory, University of Michigan, Ann Arbor, Mich.

16-20 . . Short Course: Cast Metals in Engineering Design—Application
Cast Metals Laboratory, University of Michigan, Ann Arbor, Mich.

September

13-25 . . First International Instrument Congress & Exposition
Philadelphia Convention Hall, Philadelphia, Pa.

19-26 . . Associazione Italiana di Metallurgia
Florence, Italy. 21st International Congress of Foundry Technical Associations.

27-28 . . Steel Founders' Society of America
The Greenbrier, White Sulphur Springs, W. Va. Fall Meeting.

28-30 . . Society of Industrial Packaging and Materials Handling Engineers
Chicago Coliseum, Chicago. 9th Annual National Industrial Packaging and Materials Handling Exposition.

October

6-8 . . National Foundry Association
La Salle Hotel, Chicago. 56th Annual Meeting.

7-8 . . National Foundry Association
LaSalle Hotel, Chicago. Annual Meeting.

14-15 . . Michigan Regional Foundry Conference
Ann Arbor, Mich.

14-16 . . Foundry Equipment Manufacturers' Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

15-16 . . Northwest Regional Foundry Conference
Vancouver, B. C., Can.

16-19 . . Conveyor Equipment and Manufacturers' Assn.
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

27-29 . . Grinding Wheel Institute & Abrasive Grain Association
Edgewater Beach Hotel, Chicago. Fall Meeting.

28-29 . . Metals Casting Conference
Purdue University, Lafayette, Ind. Sponsored by Central Indiana and Michiana Chapters of AFS and Purdue University.

28-30 . . Canadian Conference
Toronto, Ont., Can.

29-30 . . New England Foundrymen's Assn.
Massachusetts Institute of Technology, Cambridge, Mass.

November

1-5 . . National Metal Congress, National Metal Exposition
Palmer House, Chicago.

3-6 . . American Council of Commercial Laboratories
Roosevelt Hotel, New Orleans, La. Annual Meeting.

11-12 . . Gray Iron Founders' Society
The Homestead, Hot Springs, Va. Annual Meeting.

29 . . First International Automation Exposition
242nd Coast Artillery Armory, New York.

December

1-4 . . American Institute of Mining & Metallurgical Engineers
Hotel William Penn, Pittsburgh, Pa. Electric Furnace Steel Conference.

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MCA

Standardization and Maintenance of Sand Testing Equipment

Molding with sand of poor properties is costly. To help foundries provide the best sand to the molders, the AFS Green Sand Properties Committee has studied reproducibility of test results and standardization of equipment. Previously reported in part in *American Foundryman* and *Transactions*, the subject of standardization and maintenance of sand testing equipment is brought up to date in this article and availability of standard checking devices for measuring performance of testing equipment is brought out.

Balance and weights

1. Provide the laboratory with two balances. Use one balance for the more accurate weighing, such as moisture determinations and fineness. The other balance is to be used for the coarser weighing such as sand samples for permeability and strength tests.
2. Clean agate bearings with a cloth or soft brush to remove dirt.
3. If the balance is sluggish, examine cover over the center agate bearing. If the knife edge has scored the cover or side thrust plate, insert new hardened side thrust plates. Dull knife edges or chipped agates also cause loss of accuracy and should be replaced.
4. A balance for accurate sand test weighing should have not less than 20 mg sensitivity at 200 gram load, i.e., show one-fourth of a division unbalance for an added weight of 20 milligrams to one pan.
5. Always weigh with the balance swinging about three to eight divisions to either side of center.
6. Two sets of weights should be available. One for fine weighing, the other for coarse weighing.
7. Weights wear and lose their original accuracy and, therefore, should be handled with care. Weights in daily use should be checked every three months.
8. One set of weights should be available that shows less than 20 mg error when any combination of weights is used to a total of 200 grams.

Moisture teller

1. Rapid drying requires high air volume. Lubricate the motor according to instructions. Maintain or renew motor brushes (if used) and bearings to assure full fan speed.
2. Lubricate the pan holder bearing points and adjust so that the pan is in contact all around the top edge.
3. On older moisture tellers the air tube and inverted funnel are exposed. Be sure that the air tube is vertical and that both are firmly attached to the blower.
4. The compression ring of the sample pans must press filter cloth down tight against bottom flange of the sample pans. Tighten compression rings by placing pan against a solid metal corner. Use a square-edged tool such as a punch. Hold tool at a 45 degree angle and drive punch with a hammer so as to dent top of compression ring into vertical wall of pan. Do this every two inches. On newer style pans this is not necessary since the ring is rolled in place.
5. The filter cloth in the pan must be sufficiently clean so that one can feel hot air flowing through an empty pan. Occasionally blow air with the mouth through the screen cloth from the bottom to remove dirt. If compressed air is used, hold it some distance away to avoid bulging or loosening the screen cloth.
6. Every three months check each pan against its counterweight. Put a 50 gram weight in the pan to equal the sample weight. Rub either the counterweight or the pan (whichever is heaviest) on a flat piece of emery cloth to balance the weights equally.

Other moisture testing units

1. Check pressure or electrical moisture indicators at frequent intervals against the moisture teller or the oven method.
2. Keep the gasket in good condition on pressure type instruments. A leak may be detected by cautiously dipping in water while instrument is under pressure. Wipe carefully before opening. Tighten the gage gently if a leak is suspected at that point. Recalibration and major repairs are best done by the manufacturer of the equipment.
3. Electrical resistance moisture instruments should be serviced by the manufacturer aside from replacement of batteries, fuses, etc., as noted in the instructions that accompany the equipment.
4. Instructions for most moisture testing units involving drying give an average time for complete drying. However, it is well to dry and weigh for several increments of time to establish a safe minimum time for any particular sand or substance.
5. Where thermostats are provided, molding sands may be dried at temperatures as high as 325 F to save time. Core sand mixtures should be dried at 210-220 F to avoid loss of volatiles or gain in weight due to oxidation.

Sand rammer

1. Wipe moving parts clean and lubricate with SAE 10 oil weekly. Never use graphite on the rammer. Maintain the cam by welding tip or replacement to give a weight drop of 2 in. $\pm$0.005 in. Keep cam bearing and crosshead in condition so that cam makes full contact with the weight.
2. The special rammer base serves to provide a standard reaction to the falling weight regardless of the type of support. This eliminates differences in mounting between laboratories. A test for the net energy of the rammer can be made with calibrated metal rings available from the manufacturer of the sand rammer. The amount these rings should be flattened is predetermined. A solid timber or concrete post forms a good rammer foundation and also isolates other test equipment from shock.

continued on next page

Standardization and Maintenance of Sand Testing Equipment

(continued from page 67)

It is possible to mount a rammer on too solid a foundation so that standard ramming energy is exceeded. Since this condition can seldom be duplicated, the use of the special base is advisable in any case.

3. Before testing, riddle the sand through a ¼-in. mesh screen and place in a covered container. Uncover the container only when taking sample.

4. Weigh out each sample of sand so that the rammed specimen will be within 1/32 in. of the standard 2 in. length.

5. Worn or rough specimen tubes resist ramming energy. Standard finish is 3-6 micro-inches RMS (Root Mean Square). Mark one end of the tube to be used until it no longer gives results equal to a master tube, which is held in reserve for checking purposes.

6. See that rammer foot is not badly worn or loose. Shimming is not permissible since shims absorb energy.

7. When inserting tube and sample under rammer, lower weight gently to avoid imparting extra ramming. Weight raising lever gives better control in lowering weight.

8. Turn specimen tube ¼ turn with plunger resting on loose sand in specimen tube.

9. Take great care to turn the crank of the rammer the same each time. Make three separate turns of the cam, stopping at the 4 o'clock position each time. Do not jerk or turn the crank rapidly as this exerts extra pressure on specimen. A moderate motion is easiest to duplicate.

10. Before specimen tube is inserted in rammer, wipe the plunger head and base for pedestal cup free of loose sand.

11. The accuracy and reproducibility of any subsequent sand test depends on the degree to which the specimen is rammed. Standard ramming is vital to the exchange of information on sand properties.

Permeability meter

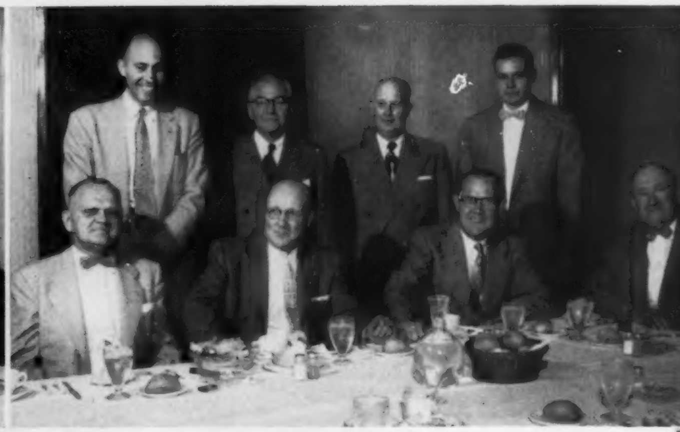
1. Unit must be level.
2. Drum must not rub on tank.
3. Zero of permeability dial must be level with water in manometer.
4. Have water level at mark.
5. Close the end of the specimen tube with stopper. Remove orifice and set tube in mercury. Pressure should read 10 cm. Drum must not settle visibly within 30 seconds.
6. Use a wet cloth to clean mercury of oxides, dust, and sand.
7. Check time of orifices, as directed by manufacturer's instructions, when they are used for control testing.
8. For best accuracy allow for temperature and barometric pressure in timing orifices and making standard stopwatch readings. Tables are available from the manufacturer.
9. Check all permeability machines daily with A.F.S. Permeability Standards for overall accuracy. These standards are available in four ranges—25, 50, 100, and 150 permeability. In case readings disagree, check over the above points and any other information contained in the manufacturer's instructions. Major repairs and recalibration should be done by the manufacturer. Should it become necessary to readjust automatic electric permeability meters, detailed directions are to be found in the manufacturer's instructions. These are available on request.
10. For all precise permeability testing, use stopwatch method.

Sand strength machine

1. Weight must swing freely.
2. Test alignment of weight and pusher arm by passing a 9/16-in. rod through the bottom compression head holes. The two holes should line up when their inner faces are 2¾ in. apart. (equivalent to a 2 in. specimen and compression heads).
3. Level the unit. As a final check see that the weight hangs free and that the edge of the magnet pushing plate coincides with zero on the strength scales.
4. Use swivel compression heads.
5. Discard visibly worn stripping posts.
6. The rack and pinion gear should be dry and free of grit. Clean with steel brush. No lubrication should be used on either.
7. Insert 2 in. specimen and adjust length of switch reversing rod so that it clears the weight by 3/16 in. *Disconnect electric current during this adjustment.*
8. When hand loading, practice turning hand wheel so that 7.5 psi green compression strength reading is obtained in 15 seconds.
9. Use a 1-in. wide brush to clean strength machine after each test. Brush sand off gear quadrant between pusher arm and weight. Brush compression heads free of loose sand.
10. Wipe top of stripping post free of loose sand.
11. Use a master proving ring to check calibration of strength machines. This may be borrowed from sand strength machine manufacturer without charge.

Green deformation accessory

1. Adjust the leaf spring bearing against the rack gear so that a friction load of ¼ lb is obtained as it is swung back and forth by hand. Where this is difficult, the spring may be replaced by a magnet available from the manufacturer, eliminating the need for adjustment.
2. Keep the fulcrum bearing well lubricated and free.
3. The friction of the maximum reading hand of the indicator must not be too great. A load of 2 oz should move this hand. In case this hand offers perceptible friction, remove bezel ring and glass so that spring load may be adjusted. A bezel with non-friction maximum hand may be secured from the manufacturer.
4. The master proving ring may be used to test a green deformation accessory for overall accuracy.



Committee members who met in Chicago during recent committee week took intermission for lunch. (Left) Standing, from left: C. K. Donoho, H. H. Wilder, R. A. Clark, G. P. Halliwell, J. E. Foster and A. B. Sinnett of AFS staff, and W. C. Jeffery. Seated, from left: W. H. Johnson, Technical Director H. J. Heine, W. R. Jaeschke, H. Bornstein, and J. S. Vanick. (Right) Standing, from left: H. J. Heine, E. T. Kindt, J. W. Costello, and H. M. Johnson, Jr. Seated, from left: H. Arneson, H. K. Swanson, H. J. Jacobson, and A. F. Pfeiffer.

Stage AFS Committee Week

Closer coordination of technical committee activities is expected to result from AFS' first Committee Week held June 7-11 at the Sherman Hotel, Chicago. Highlighted by the annual Technical Correlation Committee meeting the middle of the week, the five-day period brought together not only the heads of the eight divisions and the general interest committees for the TCC meeting, but also the Program & Papers and the Executive Committees of each of the following groups which met separately throughout the week: Safety, Hygiene & Air Pollution Control; Sand; Steel; Malleable; Gray Iron; Education; Light Metals; and Pattern. Committee Week was set up following overwhelming approval of division and general interest committee officers early in the year.

AFS President F. J. Dost, Sterling Foundry Co., Wellington, Ohio, appointed W. W. Levi, Lynchburg Foundry Co., Radford, Va., as TCC chairman to preside over the meeting June 9.

Vice-President B. L. Simpson, National Engineering Co., Chicago, and Secretary-Treasurer & General Manager Wm. W. Maloney were present to coordinate the thinking of TCC members and the Exhibit Committee which met June 4 to review the 1954 AFS Convention and Exhibit and to start planning for the 1956 Annual Meeting and Show.

Mr. Dost pointed out, in addressing the group, that TCC members and all the committees they represent form the backbone of AFS activities. Technical Director Hans J. Heine called attention to the purpose of the meeting: to hear reports on past year's work, to discuss future operations, and to integrate the activities of the divisions and committees. The reports below, highly condensed, followed.

Brass & Bronze. B. N. Ames, Doran Manganese Bronze Corp., Brooklyn, N. Y., chairman of the Brass & Bronze Division, said his division's breakfast meetings for committee members and Convention speakers, held during the 1954 AFS Congress & Show, were considered highly successful. They acquainted session chairmen with their jobs and were especially helpful to speakers making their first AFS Convention presentation. Commitments have already been made for several papers for the 1955 Convention in Houston, he said.

Education. Name of the Management Information Committee has been changed to Joint Committee for Foundry Vocational Training, W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind., reported. The new name conforms more closely to the committee's work of developing a training manual for small and medium size shops who wish to supplement their in-plant training programs. Endorsed by the National Castings Council, the joint committee will include representatives of the various trade associations.

The AFS college text is in the hands of the printer and will be ready for fall distribution, Mr. Hebard said. Interest in the AFS Apprentice Contest reached a new high this year, he declared, with the largest number of entries ever competing reported for the 31st annual competition.

Gray Iron. J. S. Vanick, International Nickel Co., New York, chairman of the Gray Iron Division, stated that his committees had cleared the decks of work accumulated during the year by means of meetings during the Convention. He briefed the group on the work of the Research Committee being carried on at Massachusetts Institute of Technology where rates of shrinkage are being determined by measurement of mold wall movement, and liquid metal feed is measured by a thermometer-type hot metal feed indicator. The Welding and the Reclamation Committees have been combined in a single unit and have recommended, in addition to compilation and periodic revision of a manual on welding, that a round table luncheon on salvage and fabrication welding be staged about every third AFS Convention.

Work of the Chill Test Committee, Mr. Vanick said, has resulted in A.S.T.M. promulgating a tentative standard method for making chill tests (AMERICAN FOUNDRYMAN, January 1954, pp. 65-66). The Gating and Risering Committee considers its pamphlet and chart, *Recommended Names for Gates and Risers*, only as a starting point and is planning to expand its activities. The Microstructure Committee is developing a chart of typical microstructures of nodular cast irons.

Light Metals. Manley E. Brooks, Dow Chemical Co., Bay City, Mich., chairman of the Light Metals Division, said in reporting on 1955 Convention plans that his group's experience in turning down certain papers offered in any one year indicated that they came back the

following year in better shape, thus raising the quality of the presentations.

Funds from Frankford Arsenal for extending the fluid flow research make possible use of available AFS and Battelle Memorial Institute funds for another film to be available in 1955.

The Alloy Recommendations Committee is ready to publish a report, he said. A new committee devoted to titanium has been organized, he concluded.

Malleable. Milton Tilley, National Malleable & Steel Castings Co., Cleveland, presented his report as chairman of the Malleable Division. A shop course, not previously sponsored by the Malleable Division, was tried for the first time at the 1954 Convention, he said, and met with such success that such meetings will be part of the 1955 program. The 1955 AFS Convention program will included considerable information on pearlitic malleable, he pointed out. Possible papers under consideration by the Malleable Program & Papers Committee include two on trace elements, a report on AFS-sponsored malleable research, several papers on pearlitic, a paper on galvanizing embrittlement, and on boron.

Pattern. J. W. Costello, American Hoist & Derrick Co., St. Paul, Minn., reported as chairman of the Pattern Division that in addition to advance planning for the 1955 Convention, the group was setting up a committee to study preparation of a manual on metal patternmaking.

Consideration of Convention sessions led to a general discussion which brought out the value of written discussion in contrast to oral discussion which often appears to have little permanent value.

Sand. F. S. Brewster, Harry W. Dietert Co., Detroit, Sand Division chairman, stated that the round table luncheon type of meeting, held for the first time this year by the Sand Division, featured brief reports by each committee. A luncheon meeting for those interested in foundry sand problems will be held at the 1955 Convention in Houston, he said. Seven sessions covering 13 papers are scheduled for the 1955 AFS Annual Meeting. Six technical sessions were sponsored by the Sand Division at the 1954 Convention, he stated, with papers grouped according to topic and graded from elementary to research, a practice he recommended.

The Sand Division has set up a Research Committee and a pH Committee, he pointed out, and has in preparation a sand manual covering operating practices and interpretation of test data to supplement the present FOUNDRY SAND HANDBOOK.

Steel. Division Chairman G. W. Johnson, Vanadium Corp. of America, Chicago, gave the Steel Division report. 1955 Convention plans include four technical sessions, one a joint meeting with the Heat Transfer Committee, and a round table luncheon. Also scheduled for next year's Convention is a color film presentation illustrating steel solidification.

This group includes several of the technical committees. From left, standing: Charles Locke, Dale Hall, Technical Director Heine, G. L. McMillin, G. W. Johnson, C. J. Zilch, R. A. Willey, C. K. Donoho, J. E. Foster, J. R. Allan, R. L. McIlvaine, W. N. Davis, S. C. Smale, and F. A. Patty. Seated, from left: R. W. Heine, G. A. Lillieqvist, Eric Welander, Carl Joseph, Milton Tilley, K. M. Smith, J. C. Radcliffe, H. T. Walworth, F. C. Fluegge, and J. W. Young.

Commenting on the division's current research project on hot tearing of steel castings, Mr. Johnson stated that correlation of data developed in eight cooperating foundries was under way at Armour Research Foundation and that it was expected to be available for foundry application soon.

Publications. H. J. Rowe, Aluminum Co. of America, Pittsburgh, Pa., chairman of the Publications Committee, reported two books almost ready for release—college text, and time and motion study for foundries. In preparation are CONTROL OF EMISSIONS FROM METAL-MELTING OPERATIONS, DIE CASTING METHODS (translation from German), ENGINEERING MANUAL FOR FOUNDRY HEALTH CONTROL, METALLOGRAPHY OF CAST METALS, AND FOUNDRY SAND PRACTICE, all new, and revisions of CAST METALS HANDBOOK and RECOMMENDED PRACTICES FOR SAND CASTING OF LIGHT ALLOYS.

Cost. Ralph L. Lee, Grede Foundries, Inc., Milwaukee, described the Cost Committee's departure from the "paper" sessions of recent year with the staging at the 1954 AFS Convention of a question-and-answer session. It was successful, he said.

Plaster Mold Casting. Two important papers expected to be available for presentation at the 1955 Convention, according to H. Rosenthal, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia, Plaster Mold Casting Committee chairman, will deal with the casting of aluminum and of magnesium in plaster.

Industrial Engineering. M. T. Sell, Sterling Foundry Co., Wellington, Ohio, chairman of the Industrial Engineering Committee, indicated that a number of the papers scheduled under the sponsorship of his committee for 1955 presentation were hold-overs from the heavy influx of papers offered for 1954. Some of the papers were being recommended for publication without prior presentation, he said.

Plant & Plant Equipment. Convention plans for the coming year include a paper on automation, according to James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., chairman of the Plant & Plant Equipment Committee.

Refractories. Walter R. Jaeschke, Whiting Corp., Harvey, Ill., reported that the Refractories Committee was concerning itself with Convention programs and with completion of the REFRACTORIES MANUAL.

Cupola Research. In presenting the report of the Cupola Research Committee, Chairman H. Bornstein, reviewed activities which culminated in the publication of THE CUPOLA AND ITS OPERATION.

Safety & Hygiene & Air Pollution. Each of the committees operating under the Safety, Hygiene & Air Pollution Control Program, Chairman J. R. Allan, International Harvester Co., Chicago, reported, are meeting once or twice a month in pursuit of an intensive campaign to complete a series of publications containing foundry data on air pollution control, noise abatement, welding safety and ventilation, dust control and ventilation, and safety. He announced the establishment of an S & H & APC Program & Papers Committee for the purpose of coordinating the Convention program activities of the various committees.

Participating in the Technical Correlation Committee meeting, in addition to those named above, were: H. C. Ahl, Jr., Down River Casting Co., Rockwood, Mich.; W. H. Ruten, Polytechnic Institute of Brooklyn; C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala.; W. H. Johnson, Naval Research Laboratory, Washington, D. C.; Carl F. Joseph, Central Foundry Div., General Motors Corp., Saginaw, Mich.; O. J. Myers, Archer-Daniels-Midland Co., Minneapolis; J. E. Foster, technical assistant; Herbert F. Scobie, editor, AMERICAN FOUNDRYMAN; and Ashley B. Sinnett, education director.

AFS Abandons Policy of "Contribution Financing"

Votes First Dues Increase Since 1948 to Expand Essential Services

The first adjustment in dues of AFS members since 1948 was voted by the Society's Board of Directors on May 13, to provide long-range financing of essential activities without recurrent solicitation of special contributions from the industry. The specific activities involved, requiring estimated annual funds in excess of $50,000 beyond the Society's present annual operating income, are:

(1) **Safety, Hygiene and Air Pollution**—currently financed by special contributions, sufficient only for the next 18 months at present rate of activity. Program needs, as recommended by a Committee of Industry and approved by the National Castings Council, are estimated at $350,000 for a minimum 10-year period. Total contributions to date, $75,000.

(2) **Education** — An activity now being stepped up under a full-time Staff Educational Director, to be directed at the secondary school level (high schools, trade schools, vocational schools), and in-plant training. Involves broad promotional work, teaching aids, school facilities, scholarships, development of practical training manuals, broader craft incentives. No present financing provisions.

(3) **Foundry Reference Library** — Contemplates development and maintenance of full-fledged Library facilities . . . complete, up-to-date, catalogued, properly staffed, available to all. Goal is a Foundry Library second to none in this country, long-needed by the industry. No present financing provisions in AFS budgets.

(4) **Research**—Present annual minimum financing ($5,000 per project) established in 1946. Increased financing imperative, even without additional projects, due to inflationary trends. Research on fundamental foundry subjects an essential activity for AFS as a technical society. Augmented program dependent on larger operating funds.

AFS Drops "Fund Drives"

For some time the AFS Board has felt that the Society should make every effort to finance its regular activities from annual operating revenues rather than by recurrent fund solicitations. During the past 15 years the industry has been solicited on at least six occasions for special AFS funds, or an average of once every two and one-half years. These fund "drives" are: Cupola Research (1939), Castings Promotion (1940), AFS Foundation (1942), Technical Development Program (1944), Headquarters Building (1950-51 and 1953), Safety & Hygiene & Air Pollution (1952).

The AFS Board has now voted to call a halt to special fund "drives." Since the important programs mentioned above are of primary interest and value to Foundry Management, they should be financed by funds derived mainly from companies rather than from individual members.

Thus the dues of Sustaining and Company members have been increased effective July 1, 1954, and at the same time the privileges that can be exercised within these classes of membership have also been increased. No change in dues of Personal members

Safety, Hygiene and Air Pollution Control program is one of activities supported by AFS dues.

is contemplated at this time. These actions, it is believed, will assure the additional financing required, provide for maximum growth of the Society, eliminate much controversy over membership interpretations, and enable greater service to the membership.

Sustaining and Company Dues

Sustaining member dues have been increased to $300 *minimum* and will appeal to those who, because of exceptional interest in the work of AFS, are willing to voluntarily elect annual dues of $300 or more. It offers opportunity to support the work of the Society in greater proportion to the value of benefits received.

The Sustaining dues increase is accompanied by two important changes in member privileges. First, any bona fide employee *residing anywhere in the same country* where the Sustaining membership is held, may now become a Personal member with dues of only $10 per year. In the past, this privilege was limited to a plant or office and the same Chapter where the Sustaining membership was held. In addition, a copy of AMERICAN FOUNDRYMAN will be mailed monthly to each plant of the Sustaining member firm, at no additional cost.

Company member dues have been increased from $65 annually to $100, and privileges altered in two major respects. First, Company members henceforth will be entitled to one copy of the annual bound volume of *Transactions*, gratis on request; second, any employee *residing in the same Chapter* where the Company membership is held, may now become a Personal member at minimum dues of $10 per year. Formerly this was limited to a single plant or office.

In announcing the new schedule of dues, the AFS Board is fully aware of existing foundry conditions, yet is convinced that their long-range decisions will immeasurably strengthen the Society and its Chapters and assure their continued growth and services. An AFS membership in excess of 15,000 is confidently expected within the next several years.

All Income Sources Examined

Before voting these dues increases, the Board of Directors examined carefully all present sources of annual income, only four being presently available to the Society. In order of importance over an average 2-year period, they are:

	avge. of total income
Dues	36.8%
AMERICAN FOUNDRYMAN	32.1%
Convention & Exhibit	23.5%
Publication Sales	6.2%
Miscellaneous	1.4%

Early in May, a complete reorganization of AMERICAN FOUNDRYMAN magazine was effected, with a definite goal of increased net income from advertising. With regard to Exhibit revenues, AFS is committed to a policy of staging the Foundry Show only every second year in the firm belief that new developments in foundry equipment, supplies and services do not warrant annual exhibits.

The annual Convention, exclusive of Exhibits, produces little net income, and attempts to increase registration fees have proved objectionable and impracticable. Publication sales are constantly increasing, but opportunities for net income here are minor.

The American Foundrymen's Society, as an international Technical Society concerned with all phases of metal casting, is obligated to provide many services in response to broad requirements and demands of the entire Metal Castings Industry. Few commercial companies have maintained their product prices unchanged since 1948, and AFS can be no exception if it continues to operate in a business-like manner.

In final analysis, acceptance of the new dues structure by Foundry Management, and by the management of equipment and supplies organizations serving the foundry industry, will be determined by approval of the Society's work . . . in recent years and in the years ahead. The Society's Officers and Directors believe that the industry will give their decisions full support.

NEW AFS DUES STRUCTURE

Effective July 1, 1954

New Annual Dues

SUSTAINING . . . . **Minimum $300.**

Sustaining membership provides opportunity for a firm to *elect its own annual dues* in proportion to benefits received . . . e.g., based on number of Personal members, number of plants or offices covered, broad participation in AFS activities, unusual recognition accorded.

New Privilege: Any bona fide employee, residing *anywhere in same country* where Sustaining membership is held, may now become a Personal member with dues of $10 annually. (Formerly limited to employees at plant or office and in same Chapter where Sustaining membership held.)

New Privilege: AMERICAN FOUNDRYMAN mailed monthly to *each plant* of Sustaining member firm, gratis.

Other Privileges remain: AMERICAN FOUNDRYMAN subscription, advance copies of AFS Research reports; one copy annual TRANSACTIONS; advance Convention registration of employees at member fee; publication discounts; Chapter affiliation.

COMPANY . . . . **$100.**

Company member privileges broadened, now permit employees, *within same Chapter* where Company membership is held, to become Personal members with dues of $10. (Formerly limited to plant or office where Company membership held.)

New Privilege: One copy annual TRANSACTIONS gratis on request. (Formerly available only by purchase.)

Other Privileges remain: AMERICAN FOUNDRYMAN subscription; advance Convention registration of employees at member fee; publication discounts; Chapter affiliation.

PERSONAL . . . . **$20.**

No change in dues. Available to any person interested in advancing AFS objects. Dues $20 annually . . . with *3 exceptions:*

No. 1 (unchanged): Personal members in educational or domestic government work, dues . . . . $10.

No. 2 (NEW): Personal members employed by and residing in *same country* as a Sustaining member, dues . . . . $10.

No. 3 (NEW): Personal members employed by and residing in *same Chapter* as a Company member, dues . . . . $10.

Privileges of all Personal members unchanged: AMERICAN FOUNDRYMAN monthly; Convention registration at member fee; Chapter affiliation; publication discounts; TRANSACTIONS at member prices; service on AFS technical committees and programs.

JUNIOR . . . . **$4.**

No change in dues. Junior membership available to anyone less than 25 years of age, and (NEW) to Students in recognized educational institutions. All privileges unchanged, essentially the same as for Personal members.

The 1955 AFS Convention at Houston, Texas was the probable subject for discussion by this group at the Chapter Officers Conference. From left: Bruce L. Simpson, AFS Vice-President, Texas Chapter's Chairman E. W. Wey, Vice-Chairman J. R. Hewitt, of Texas, and AFS President Frank J. Dost.

Chapter News

11th Annual Chapter Officers Conference Held at Chicago

THE 11th annual AFS Chapter Officers' Conference was held on June 17-18 in Chicago's Hotel LaSalle. A total of 87 officers, representing all 42 local chapters, attended the conference, of which National President Frank J. Dost acted as chairman. The two-day meeting was called to brief chapter chairmen and program chairmen on the problems involved in planning programs consistent with the technical objectives of AFS.

The conference was called to order by Chairman Dost, who welcomed the delegates, explained the purpose of the meeting, and then sketched in the fundamental background of the Society. "The technical program," he said, "is the most important activity of AFS." In order to implement a series of chapter meetings commensurate with this ideal, early planning and a good understanding of AFS objectives are required, Dost pointed out.

The same standards must be used in local chapter meetings as in the national Convention, Dost said. There must be no selling, no use of trade names. The chapters must also work to increase membership in order to more widely disseminate technical information throughout the industry. Good technical programs, he stated, are the best means of luring new members into the Society.

The chapters, Dost continued, must be recognized by industry management. Give management the facts, he asserted, and management will back the activities of the chapters.

Chairman Dost concluded his remarks with a review of current activities in the National AFS Headquarters program, including reference to the new headquarters building in Des Plaines, Ill., and the new status of AMERICAN FOUNDRYMAN Magazine.

Next speaker was Hans J. Heine, technical director of AFS, who reviewed technical projects now underway. He particularly stressed the function of the committees in Society-sponsored research and explained some of the problems encountered in the publication of technical books and manuals. Heine showed how the National Apprentice Contest is integrated into the technical program through cooperation of local chapters.

"Organizing a Chapter Program" was the topic chosen by Wm. W. Maloney, Secretary-Treasurer and General Manager of AFS. The task is not for one man, he said, but should be handled by a carefully-selected committee, which itself should represent a proper cross-section of the chapter. It is the responsibility of the chairman to see that the committee is properly formed.

Mr. Maloney briefly outlined some of the steps required in organizing a chapter meeting, including setting-up the meeting room, arranging the speakers' table, use of an agenda, and other details that produce a "well-run meeting."

Over 100 chapter officers, AFS officers, directors, and staff members met at Chapter Officers Conference.

A six-man panel of chapter chairmen functioned as a clinic to aid other chairmen in organizing their programs. Members included John Bermingham, Northern California; L. Currie, Central Michigan; F. J. Rutherford, Ontario; R. V. Osborne, Wisconsin; F. E. Kurtz, Central Indiana; and Charles Chisolm, Tennessee.

The panel answered questions from the floor concerning the mechanics of chapter meeting procedure. Among the subjects discussed were: invitation of guest speakers, procedure in planning meeting schedules, handling of speakers during their visit, covering of meeting expenses. Some divergence was found in the handling of expenses and the meeting was polled by Chairman Dost to determine majority trends.

Special problems facing the more remote chapters, as in Canada and Mexico City, were aired. Chairmen of these groups were given suggestions for developing local talent for meetings, necessitated by the extreme travel distances involved.

AFS President Frank J. Dost (on speakers' stand) welcomes delegates from Mexico Chapter, Secretary-Treasurer Luis Delgado Vega (left), and Vice-Chairman U. Lopez Ayala (center). AFS Secretary-Treasurer and General Manager Wm. W. Maloney at right.

Good Board Meetings Necessary

"Good board meetings are the hallmark of good chapters," said AFS Secretary-Treasurer and General Manager Wm. W. Maloney in discussing the job of the chapter chairman. "A one-man chapter is no chapter at all," he warned, stressing that the chairman should meet early with the board and other officers and should seek the cooperation of the industry in the area.

Educational programs for chapters were discussed by new AFS Education Director A. B. Sinnett. In making the introduction, Chairman Dost said that AFS encourages foundry education generally, although emphasizing the secondary school and foundry plant levels. The Society cooperates with FEF in colleges, universities and technical schools. Chapters will be encouraged to formulate educational programs in the future, particularly since the new Pangborn Foundation grant, which will probably require an active education committee for chapter participation.

Education Director Sinnett explained what the chapters can do to further an educational program. Just over half of them have such a program, he said. The organization of an educational committee is a long-term situation, and it must be a working group composed of top management if possible, with some educators sitting on the committee.

"Education," Sinnett stated, "is one of the most fertile fields open to AFS." Line supervision must come from the ranks and automation will require more and more trained supervisory personnel. Working in this area, Sinnett said, AFS will produce a manual designed to aid in the training of supervisory prospects. The program will be specific, not an apprentice type, but similar, and intended for smaller and meduim-sized foundries.

A serious problem exists, according to Sinnett, in the training of vocational teachers in foundry practice. Teacher training in cast metals has been provided in only one university heretofore; a second will soon provide such a course.

"Propagandizing" is a valuable tool from which will accrue considerable advantage to the industry, particularly because of the mass ignorance of the cast metals industry by the public. Best means for dissemination of information about the foundry is shop training in the secondary schools.

Sinnett concluded with a reference to the new Pangborn grant, which, he said, will serve as a "feeder" program for the FEF activities in higher education.

Executive Director E. J. Walsh of FEF next took the speaker's podium and briefly outlined the function of his group in the educational field. FEF, he said, supports the AFS educational program 100 per cent and will furnish all possible assistance to the National Headquarters or local chapters. An organized "feeding" program is tremendously important, Walsh declared, particularly for FEF, which usually grants scholarships during the junior and senior years in college.

An extended question-and-answer period followed the general discussion of educational problems in AFS. The difficulty involved in obtaining qualified instructors was mentioned most often on the floor. The chapter officers exchanged experiences and ideas that have worked best in their areas.

Frank C. Cech, Cleveland Trade School instructor and an AFS National Director, took the floor to give the delegates the benefit of his years of experience in education as it relates to foundry. The so-called "cafeteria system" of education rules out foundry in the schools, he stated. Consequently, we should start much lower down in the scale, go all the way to the grammar and junior high school for indoctrination in the metal shops. Most important, more publicity is needed; the public should be made really aware of the function of the industry in our economic structure.

H. F. Scobie, Editor, AMERICAN FOUNDRYMAN, explained the recent reorganization of the magazine and the basis upon which it would be operated in the future. Purpose, he said, is to expand the publication, increase its usefulness to the industry, and broaden its editorial content so as to include a maximum of technical and practical information for all foundrymen. In carrying out its new objectives, the magazine will be re-styled and will be given a "new look" to increase its readability. J. M. Eckert, new advertising manager, was introduced.

Chapter Reporting Discussed

Following Scobie's presentation, questions were handled from the floor. Considerable time was devoted to the mechanics of reporting chapter meetings. The magazine provides one of the best publicity outlets for the chapters and it was emphasized that they have not made the best use of it.

Secretary Maloney explained the function of the AFS Nominating Committee and called for nominations from eligible chapters. He referred to those sections of the Society By-Laws controlling this phase of the activities.

Conference Chairman Dost reviewed the recent revisions to the AFS By-Laws, with reference to Board reorganization. He outlined the purpose of the new regional setup and the addition of members to the Board, which has been increased from 18 to 24 directors. Nominating and election procedures have been altered and Chairman Dost showed how the new structure will function.

Concluding the first day's program, AFS Vice-President Bruce L. Simpson discussed contacts with local chapters by national officers and directors. He explained procedure in scheduling "national officer's" nights and read the list of chapters that would be visited by each official.

Following a social hour, the annual Conference Dinner was held in the Chi-

Educational chart display (left) attracted Chairman W. Holden, Saginaw Valley Chapter (left), Vice-Chairman W. C. H. Dunn (center) and Chairman C. Bourassa of Eastern Canada Chapter. (Right) Chairman A. S. Morgan, Canton District Chapter looks through copy of *Transactions*. Secretary-Treasurer J. Kauzlarich, Central Illinois Chapter (left), and Vice-Chairman H. A. Biddinger of Canton District are interested observers.

cago Room of the Hotel LaSalle. Guest speaker was Melvin C. Lockard, president, First National Bank, Cobden, Ill. His humor proved an entertaining diversion for the delegates.

Wm. N. Davis, AFS safety, hygiene, and air pollution control director, opening speaker for the second day, emphasized management's responsibility for execution of all phases of the industry's Safety & Hygiene & Air Pollution Control Program, pointing out that the National Castings Council recognized this activity through its whole-hearted support and recommendation that AFS spearhead the work. As an example of the value of S & H & AP committee work, he cited an example in which technical information provided to foundrymen formed the basis for development of a sound, technically-correct air pollution code.

Panel Discussion on Membership

"Keeping Up the Membership," a panel discussion by six chairmen of chapters who made their membership targets, brought out how they maintain and build membership in pursuit of their objective of advancing the art and science of production and utilization of castings. Panel members were: D. E. Best, Philadelphia; E. E. Pollard, Birmingham District; W. Holden, Saginaw Valley; C. R. Gregg, Southern California; D. W. Clark, Northeastern Ohio; and A. W. Johnson, Twin City.

At the conclusion of the panel session, certificates of recognition were distributed to the chairmen of chapters which had made their targets during 1953-54. In addition to the above six, they were: Central Michigan, Detroit, Mexico City, Tennessee, and Tri-State.

Vice-President Simpson announced the new dues structure (approved by the Board May 13 and effective July 1) which provides for minimum Sustaining member dues of $300 with unlimited Affiliate privileges anywhere, and a copy of AMERICAN FOUNDRYMAN for each plant of the Sustaining member firm. Company memberships after July 1 are $100, with Affiliate privileges limited to chapters in which membership is held. Previously limited to Sustaining members, *Transactions* will now be available to Company members gratis, on request. Previous privileges, such as discounts on publications and advance registration at member rate for all employees of Sustaining or Company member firms will continue, as well as advance copies of AFS research reports (for Sustaining members).

A. A. Hilbron, AFS convention and exhibit manager, briefed the conference on the success of the 1954 AFS Convention and Show, and said members could look forward to an equally successful non-exhibit meeting in Houston, May 22-27, 1955.

A national and local program of public relations is already underway. It was outlined by Terry Koeller of Terry Koeller Associates, Chicago, who are handling the campaign for AFS.

The 1954 Chapter Officers Conference concluded with the customary Shakeout session, in which all questions not answered in previous sessions were covered.

The list of chapter officers attending the conference follows:

BIRMINGHAM—Chairman E. E. Pollard, Caldwell Foundry & Machine Co., Birmingham, Ala. Vice-Chairman & Program Chairman A. J. Fruchtl, U. S. Pipe & Foundry Co., Birmingham, Ala. Secretary-Treasurer J. F. Drenning, Kerchner, Marshall & Co., Birmingham, Ala.

BRITISH COLUMBIA—Chairman H. H. Havies, Vivian Engine Works, Vancouver, B. C. Vice-Chairman & Program Chairman P. H. Hookings, Major Aluminum Prods., Ltd., Vancouver, B. C.

CANTON DISTRICT—Chairman A. S. Morgan, Babcock & Wilcox Co., Barberton, Ohio. Vice-Chairman & Program Chairman H. A. Biddinger, F. E. Myers & Bro. Co., Ashland, Ohio.

CENTRAL ILLINOIS—Vice-Chairman & Program Chairman R. F. Heiden, Galva Foundry Co., Galva, Ill. Secretary-Treasurer J. Kauzlarich, Peoria Malleable Castings Co., Peoria, Ill.

CENTRAL INDIANA—Chairman F. E. Kurtz, Electric Steel Castings Co., Indianapolis. Vice-Chairman J. A. Barrett, National Malleable & Steel Castings Co., Indianapolis.

CENTRAL MICHIGAN—Chairman L. Currie, Gale Mfg. Co., Albion, Mich. Vice-Chairman & Program Chairman G. R. Lloyd, Albion Malleable Iron Co., Albion, Mich.

CENTRAL NEW YORK—Chairman J. Gibson, Sweets Foundry, Inc., Johnson City, N. Y. Vice-Chairman & Program Chairman J. O. Ochsner, Crouse-Hinds Co., Syracuse, N. Y.

CENTRAL OHIO—Chairman R. M. Meyer, Ohio Steel Foundry Co., Springfield, Ohio. Vice-Chairman & Program Chairman N. H. Keyser, Battelle Memorial Institute, Columbus, Ohio.

CHESAPEAKE—Chairman M. J. Kelly, Kelco Corp., Baltimore, Md. Vice-Chairman & Program Chairman J. O. Danko, Danko Pattern & Mfg. Co., Baltimore, Md.

CHICAGO—President R. L. Doelman, Miller & Co., Chicago. Vice-President & Program Chairman J. T. Moore, Wells Mfg. Co., Skokie, Ill.

CINCINNATI DISTRICT—Chairman H. F. Greek, Hill & Griffith Co., Cincinnati. Vice-Chairman & Program Chairman J. D. Sheley, Black Clawson Co., Hamilton, Ohio. Membership Chairman E. J. James, Dayton Oil Co., Dayton, Ohio.

CORN BELT—Chairman J. M. Buckholz, Dempster Mills Mfg. Co., Beatrice, Neb. Vice-Chairman & Program Chairman V. Holmes, Paxton-Mitchell Co., Omaha, Neb.

DETROIT—Chairman C. B. Schneible, Claude B. Schneible Co., Detroit. Vice-Chairman & Program Chairman C. Hockman, Cadillac Motor Div., General Motors Corp., Detroit.

EASTERN CANADA—Chairman C. Bourassa, Archer-Daniels-Midland Co. of Canada, Ltd., Westmount, Que., Canada. Vice-Chairman & Program Chairman W. C. H. Dunn, Western Pattern Works, Montreal, Que., Canada.

EASTERN NEW YORK—Chairman W. C. Stevenson, Rensselaer Valve Co., Troy, N. Y. Vice-Chairman & Program Chairman R. W. MacArthur, Ramsey Chain Co., Albany, N. Y.

METROPOLITAN—Chairman C. Schwalje, Worthington Corp., Harrison, N. J. Vice-Chairman & Program Chairman C. D. Preusch, Spaulding Works, Crucible Steel Co. of America, Orange, N. J.

MEXICO—Vice-Chairman & Program Chairman U. Lopez Ayala, Fundicion El Rosario, Pueblo, Mexico. Secretary-Treasurer Luis Delgado Vega, Cia Proveedora de Industrias, S. A., Mexico, D. F.

MICHIANA—Chairman R. A. Payne, Sterling Brass Foundry, Elkhart, Ind. Vice-Chairman & Program Chairman F. N. Davis, Oliver Corp., South Bend, Ind.

MID-SOUTH—Chairman M. B. Parker, Jr., M. B. Parker Co., Memphis, Tenn.

MO-KAN—Chairman L. Canfield, Canfield Foundry Supplies & Eqpt., Kansas City, Kans. Secretary H. E. Julian, Blue Valley Foundry Co., Kansas City, Mo.

NORTHEASTERN OHIO—Chairman D. W. Clark, Forest City Foundries Co., Cleveland. Vice-Chairman & Program Chairman L. T. Crosby, Sterling Wheelbarrow Co., Cleveland.

NORTHERN CALIFORNIA—Chairman John Bermingham, E. F. Houghton & Co., San Francisco. Vice-Chairman & Program Chairman C. D. Russell, Phoenix Iron Works, Oakland, Calif.

NO. ILL.-SO. WIS.—Chairman W. H. Shinn, Gunite Foundries Corp., Rockford, Ill.

NORTHWESTERN PA.—Chairman B. D. Herrington, Hickman Williams & Co., Pittsburgh, Pa. Secretary R. L. Johnson, Bucyrus-Erie Co., Erie, Pa.

ONTARIO—Chairman F. J. Rutherford, Refractories Engineering & Supplies, Ltd., Hamilton, Ont. Vice-Chairman W. H. L. Bryce, International Harvester of Canada, Ltd., Hamilton, Ont. Program Chairman F. Kellam, Electro Metallurgical Co. of Canada, Ltd., Welland, Ont.

OREGON—Chairman P. J. Laugen, Oregon Steel Foundry Co., Portland, Ore. Vice-Chairman & Program Chairman H. Czyzewski, Metallurgical Engineers, Inc., Portland, Ore.

PHILADELPHIA—Chairman D. E. Best, Bethlehem Steel Co., Bethlehem, Pa. Vice-Chairman C. W. Mooney, Jr., Olney Foundry, Link-Belt Co., Philadelphia.

QUAD CITY—Chairman W. Ellison, Thiem Products, Inc., Milwaukee. Vice-Chairman & Program Chairman C. C. Fye, John Deere Harvester Works, East Moline, Ill. Secretary-Treasurer J. G. Smillie, John Deere & Co., Moline, Ill.

ROCHESTER—Chairman D. M. Wilson, American Brake Shoe Co., Rochester, N. Y. Vice-Chairman & Program Chairman D. E. Webster, American Laundry Machinery Co., Rochester, N. Y.

SAGINAW VALLEY—Chairman W. Holden, Eaton Mfg. Co., Foundry Div., Vassar, Mich. Vice-Chairman & Program Chairman F. P. Strieter, Dow Chemical Co., Midland, Mich.

Left to right: Kenneth Davis, Budd Co., Philadelphia; W. Donald Bryden, Philadelphia Bronze and Brass Corp., Philadelphia; Warner B. Bishop, Archer-Daniels-Midland Co., Cleveland, and Charles O. Butler, Palmyra, N. J., at the May meeting of the Philadelphia Chapter.—*Photo courtesy Leo Houser, Dodge Steel Co.*

ST. LOUIS DISTRICT—Chairman F. J. Boeneker, Bronze Alloys Co., St. Louis. Vice-Chairman & Program Chairman G. L. Mitsch, American Car & Foundry Co., St. Louis.

SOUTHERN CALIFORNIA—Chairman C. R. Gregg, Gregg Iron Foundry, El Monte, Calif. Vice-Chairman & Program Chairman W. C. Baud, Food Machinery & Chemical Corp., Vernon, Calif.

TENNESSEE—Chairman C. Chisolm, Wheland Co., Chattanooga, Tenn. Vice-Chairman & Program Chairman W. B. Greiser, Ross-Meehan Foundries, Chattanooga, Tenn.

TEXAS—Chairman E. W. Wey, Dee Brass Foundry, Inc., Houston, Texas. Vice-Chairman & Program Chairman J. R. Hewitt, Hewitt-McGrail Co., Houston.

TIMBERLINE—Chairman E. B. McPherson, McPherson Corp., Denver, Colo. Vice-Chairman & Program Chairman W. R. Manske, American Brake Shoe Co., Denver, Colo.

TOLEDO—Chairman C. E. Eggenschwiler, Bunting Brass & Bronze Co., Toledo, Ohio. Vice-Chairman & Program Chairman W. W. Camp, Freeman Supply Co., Toledo, Ohio.

TRI-STATE—Vice-Chairman & Program Chairman W. H. Mook, Bethlehem Supply Co., Tulsa, Okla. Secretary R. F. Forsythe, Big Four Foundry Co., Tulsa, Okla.

TWIN CITY—Chairman A. W. Johnson, Northern Malleable Iron Co., St. Paul, Minn. Vice-Chairman & Program Chairman H. H. Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis. Secretary-Treasurer L. K. Polzin, Minneapolis Chamber of Commerce.

WASHINGTON—Chairman J. N. Wessel, Puget Sound Naval Shipyard, Bremerton, Wash. Program Chairman H. R. Wolfer, Puget Sound Naval Shipyard.

WESTERN MICHIGAN—Chairman J. A. Van Haver, Sealed Power Corp., Muskegon, Mich.

WESTERN NEW YORK—Chairman W. H. Oliver, American Radiator & Standard Sanitary Corp., Buffalo, N. Y. Vice-Chairman & Program Chairman L. Greenfield, Samuel Greenfield Co., Inc., Buffalo, N. Y.

WISCONSIN—President R. V. Osborne, Lakeside Malleable Castings Co., Racine, Wis. Program Chairman N. N. Amrhein, Federal Malleable Co., West Allis, Wis. Director A. F. Pfeiffer, Allis-Chalmers Mfg. Co., West Allis.

In addition to chapter officers and AFS staff members, the following national directors also attended the conference: Frank C. Cech, Cleveland Trade School, Cleveland; Lewis H. Durdin, Dixie Bronze Co., Birmingham, Ala.; Edwin C. Hoenicke, Eaton Mfg. Co., Detroit; Walter J. Klayer, Aluminum Industries, Inc., Cincinnati; Eugene R. Oeschger, General Electric Co., Schenectady, N. Y.; and Claude B. Schneible, Claude B. Schneible Co., Detroit.

Target Is 12,500

A new target of 12,500 members by June 30, 1955, was set at the Chapter Officers' Conference held June 17-18 at the La Salle Hotel, Chicago. Membership in the American Foundrymen's Society as of June 30, 1954, was 11,551.

In announcing the new target, AFS President Frank J. Dost said:

"As an organization we should always be interested in building up our chapter membership.

"First, we need to maintain our chapter organizations. We constantly need 'new blood,' young men and experienced foundrymen, to bring in new ideas, develop new chapter interests, and provide worthwhile audiences for speakers.

"Second, membership is closely related to the chapters' function of truly representing the Castings Industry. We need to interest all segments of the industry.

"Third, and most important of all, as a technical society we can urge the progress of our industry only in proportion to the greater knowledge that the individual received through AFS contacts."

Company Members

During June, one new company member was added to the rolls:

***Atlantic Machine Tool Works, Inc.*, Newington, Conn.; Henry S. Brudney, vice-president and treasurer. (Metropolitan Chapter)**

Attending the Northeastern Ohio Chapter's Old Timers Night meeting, held May 20, left to right, are: Stephen E. Kelly, Eastern Malleable Iron Co.; Dave Clark, Forest City Foundries Co.; William C. Manwell, M.B.M. Foundry, Inc., and B. D. Fuller, Rocky River, Ohio.

Northern California

A regular meeting of the board of directors of the Northern California Chapter was held at El Curtola Cafe, Oakland, Calif., on June 1. Twenty-four members were present. The meeting was called to order by Chairman Bill Gibbons and then turned over to Chairman elect John Bermingham who announced the appointment of the 1954-55 chapter committee chairmen.—*Davis Taylor.*

Mexico City

"The Design, Construction and Operation of Cupolas" was the subject of a talk by Ing. Crispin Martinez Milan, guest speaker at the June meeting of the Mexico City Chapter, Mexico City. Mr. Martinez illustrated his talk with detailed drawings of cupolas. Following the speech, a color movie was shown on electric welding. A round table discussion concluded the meeting.—*N. S. Covacevich.*

Philadelphia

A program featuring two guest speakers, Kenneth Davis, Budd Co., Philadelphia, and Warner B. Biship, Archer-Daniels-Midland Co., Cleveland, highlighted the May meeting of the Philadelphia Chapter, attended by approximately 120 members and guests. The first speaker, Mr. Davis, addressed the group on "The 'C' Process of Shell Molding." The second speaker, Mr. Bishop, discussed "The 'D' Process of Precision Casting."

The meeting concluded with the presentation of an award to Robert J. Luckenbill, Dodge Steel Co., Philadelphia, who received the Steel Molding Division award in the AFS Apprentice Contest for two consecutive years.—*C. R. Sweeny.*

Michigan State College

The annual Student-Industry banquet sponsored by the Michigan State College Student Chapter was attended by approximately seventy-five local foundrymen on May 27 at the Kellogg Center building on the M.S.C. campus. Following the dinner, John Smith, plant manager, Chevrolet Gray Iron Foundry, awarded thirteen Foundry Educational Foundation scholarship certificates to M.S.C. students.

Featured speaker of the evening was Gosta Vennerholm, metallurgist, Ford Motor Co., Dearborn, Mich. Mr. Vennerholm spoke on "Application of Foundry Practices to Automotive Engineering." In addition to the metallurgical advances in cast metals, Vennerholm discussed the advantages of shell molding and the recent experiments being carried on with water-cooled unlined cupolas.

A miniature sand muller 2½ in. in diameter, cast in aluminum by the students, was given to each foundryman attending as a memento of the occasion.

Newly elected student officers for 1954-55 were introduced at the banquet. They are: C. J. Thomas, *chairman;* Thomas J. Linton, *vice-chairman;* Jacob Goldberg, *corresponding secretary,* and Richard Morris, secretary-treasurer.—*C. C. Sigerfoos.*

Southern California

"Old Timers Night" scheduled each June to honor all past chapter presidents of the Southern California Chapter, was held June 11 at the Rodger Young Auditorium, Los Angeles. Albert Zima, International Nickel Co., Los Angeles, past-president (1939-40) of the chapter, spoke briefly on behalf of all the past-presidents.

Featured speaker at the meeting was Lt. Don Blake, U. S. Naval Reserve, who spoke on "Murder Under Water." Blake described his wartime experiences in under-water demolition, an operation in which he was one of the pioneers.

An evening sand school conducted by Frank S. Brewster, general manager and vice-president, Harry W. Dietert Co., Detroit, was held May 19 and 20 at the University of Southern California Auditorium, Los Angeles, comprising the technical program at the May meeting of the Southern California Chapter. Mr. Brewster stressed that sand tests are of no value if the results are not applied in the foundry. The sand school covered the entire field of molding and core sand control, interpretation of test results, sand preparation, and elimination of casting defects due to sand conditions.

The sand school meetings were climaxed by a dinner attended by 200 members and guests at the Rodger Young Auditorium, Los Angeles, on May 21.—*Otto H. Rosentreter.*

Northwestern Pennsylvania

Two members of the Northwestern Pennsylvania Chapter, Thomas Eagan, Cooper-Bessemer Co., Grove City, Pa., and Earl M. Strick, Erie Malleable Iron Co., Erie, Pa., were honored at the May meeting of the chapter, held in the Blue Room of the Erie Moose Club. Gold desk sets equipped with barometers were presented to Mr. Eagan and Mr. Strick for their outstanding service to the foundry industry by Frank Volgstadt, Cleveland Flux Co., Erie, Pa. At the 1954 AFS Convention, Eagan received the Seaman Gold Medal and Strick was

Left to right, Charles R. Gregg, Gregg Iron Foundry; Frank S. Brewster, Harry W. Dietert Co., and Hubert Chappie, National Supply Co., at the sand school conducted by Mr. Brewster at the May meeting of the Southern California Chapter.—*Photo courtesy K. F. Sheckler.*

Scene from the Washington Chapter's annual Ladies' Night dinner, held at the Elks Club, Bremerton, Wash., on May 22.

At the annual Student-Industry banquet sponsored by Michigan State College Student Chapter, left to right, Kenneth Priestley, Vassar Electroloy Products, Inc.; guest speaker, Gosta Vennerholm, Ford Motor Co., and Frank Rote, Albion Malleable Iron Co.

Participants in the round table discussion at the May meeting of the Twin City Chapter, left to right, Nate Levinsohn, Minneapolis-Moline Co.; O. Jay Myers, Archer-Daniels-Midland Co., and A. W. Johnson, Northern Malleable Iron Co.

Left to right, Clayton D. Russell, chairman, Apprentice Training Program, Northern California Chapter; Hector Martinez, Pacific Steel Castings Co., first place winner in the Steel Division of the chapter's Apprentice Training Contest; Lane Currie, H. C. Macaulay Foundry Co., first place winner in the Gray Iron Division of the Apprentice Training Contest; and W. S. Gibbons, chairman, Northern California Chapter.

awarded an Honorary Life Membership in AFS.

Following the presentation, election of chapter officers for the coming year was held. Results of the election were as follows: *chairman,* Bailey D. Herrington, Hickman, Williams & Co.; *vice-chairman,* Jacob Diemert, Erie Casting Co.; *secretary,* Robert L. Johnson, Bucyrus-Erie Co.; treasurer, Richard C. Strong, Griswold Mfg. Co.

After the election, the program committee showed a film about foundry operations at the new Ford Motor Co. plant in Berea, Ohio.

Three copies of Bruce Simpson's book "Development of the Metal Casting Industry" were presented by National Chairman of the AFS Youth Encouragement Committee, Earl M. Strick, Erie Malleable Iron Co., on behalf of the Northwestern Pennsylvania Chapter to the Erie Public School District, Erie, Pa., on May 24. The books will be used by the science teachers of the high schools to acquaint their students with the history of casting metals—*Roy A. Loder and Earl M. Strick.*

Ontario

F. W. Kellam, Electro Metallurgical Co. of Canada, Welland, Ont., Canada, was master of ceremonies at the Ontario Chapter's first Ladies' Night meeting held May 20 at the Royal York Hotel, Toronto, Canada, attended by over one hundred couples. A cocktail hour began the evening's festivities, followed by dinner. A floor show and prizes, followed by dancing concluded the evening—*M. W. Hollands.*

New Chapter Officers

Birmingham

Chairman, Edwin E. Pollard, Caldwell Foundry and Machine Co.; *vice-chairman,* Albert J. Fruchtl, U. S. Pipe & Foundry Co.; *secretary-treasurer,* John F. Drenning, Kerchner Marshall & Co. *Directors:* Biddle W. Worthington, McWane Cast Iron Pipe Co.; K. P. Efird, Jr., Central Foundry Co.; W. B. Spann, National Cast Iron Pipe Div., James B. Clow & Son; H. W. Little, Anniston Foundry Co.; V. I. Byford, Production Foundries Div., Jackson Industries, Inc.; M. W. White, Laclede-Christy Co.

British Columbia

Chairman, Howard H. Havies, Vivian Diesel & Munitions, Ltd., Vancouver, B. C.; *vice-chairman,* Paul H. Hookings, Major Aluminum Products, Ltd.; *secretary-treasurer,* Lovick P. Young, A 1 Steel & Iron Foundry, Ltd. *Directors:* S.

Investment Casters Meet

Investment Casting Institute launched its first industry-wide meeting May 6, at the Hotel Carter, Cleveland. Meeting was highlighted with talks by Dr. Nicholas J. Grant, at podium above, Massachusetts Institute of Technology, who spoke on *"Mold and Metal Temperatures and their Effect on Casting Quality;"* James Coley, Ajax Electrothermic Corp., discussed *"Induction Melting, Theory and Practice;"* Roger W. Waindle, Wai Met Engineering Co., covered *"Specific Problems in Alloy Casting."* At the afternoon session Frank C. Howard, Howard Foundries, Inc., spoke on *"Opportunities Unlimited;"* W. I. Matthes, Arwood Precision Casting Corp., advised the group on *"Selling the Industrial Market,"* while Ted Operhall, Misco Precision Casting Co., Covered *"Selling the Defense Industry."*

Gold desk sets were awarded for outstanding service to the foundry industry to Earl M. Strick, left, and Thomas Eagan, right, by Frank Volgstadt, center, at the May meeting of the Northwestern Pennsylvania Chapter.

J. Hatchett, Canada Metal Co., Ltd., Jim T. Hornby, Balfour Guthrie (Canada) Ltd.; James McCulloch, Canadian Sumner Iron Wks., Ltd.

Canton

Chairman, Aldred S. Morgan, Babcock & Wilcox; *vice-chairman,* H. A. Biddinger, F. E. Myers & Bro. Co.; *secretary,* F. A. Dun, Babcock & Wilcox; *treasurer,* Wendell W. Snodgrass, Massillon Steel Castings Co. *Directors:* John J. Popa, American Steel Foundries; Thomas H. Brown, National Rubber Mach. Co.; Jesse J. Baum, American Cast Products, Inc.; James Meehan, Canton Pattern & Mfg. Co.

Central Illinois

Chairman, Burton L. Bevis, Caterpillar Tractor Co.; *vice-chairman,* Ray F. Heiden, Glava Foundry Co.; *secretary-treasurer,* John F. Kauzlarich, Peoria Malleable Castings Co. *Directors:* Henry Felten, Peoria Malleable Castings Co.; Lawrence Kinsinger, Caterpillar Tractor Co.; Ralph Green, International Harvester Co.; John Hrvetin, Caterpillar Tractor Co.

Central Indiana

Chairman, Fred E. Kurtz, Electric Steel Castings Co.; *vice-chairman,* James A. Barrett, National Malleable & Steel Castings Co.; *secretary,* Wm. Fitzsimmons, International Harvester Co.; *treasurer,* R. H. Brookes, Link-Belt Co. *Directors:* Dallas Lunsford, Perfect Circle Corp.; Charles E. Drury, Central Foundry Div., G.M.C.; E. G. Lints, Corn Products Sales Co.; J. A. Nelson, Hoosier Iron Works; N. C. Kottkamp, Langsenkamp Wheeler Brass Works.

Central Michigan

Chairman, Lachlan Currie, Gale Mfg. Co.; *vice-chairman,* Gardner R. Lloyd, Albion Malleable Iron Co.; *secretary-treasurer,* Gerald D. Strong, Battle Creek Foundry. *Directors:* A. C. Hensel, Albion Malleable Iron Co.; Charles Rowley, Consolidated Press Div., E. W. Bliss Co.; Harry J. Sprecken, Jr., Sturgis Foundry Corp.; Robert D. Dodge, Archer-Daniels-Midland Co.

Cincinnati

Chairman, Harry F. Greek, Hill & Griffith Co.; *vice-chairman,* John D. Sheley, Black Clawson Co.; *secretary,* R. J. Westendorf, Dayton Casting Co.; *treasurer,* Robert C. Schick, The Ranson & Orr Co.; *assistant treasurer,* Robert H. Ritter, Oberhelman-Ritter Foundry Co. *Directors:* William Gilbert, Jr., Buckeye Foundry Co.; William Dine, St. Mary's Foundry Co.; Arthur Hoffheimer, Jr., Buckeye Products Co.; Arthur Jones, Ingersoll Rand Co.; Charles E. Koehler, Hamilton Brass Alum. Castings Co.; Richard A. Poirier, Black Clawson Co.; Raymond L. Young, Peerless Foundry Co.

Detroit

Chairman, Claude B. Schneible, Claude B. Schneible Co.; *vice-chairman,* C. W. Hockman, Cadillac Motor Car Div., G. M. C.; *secretary,* Elmer W. Gerhard, Jr., Swedish Crucible Steel Co.; *treasurer,* Eugene J. Passman, Frederic B. Stevens, Inc. *Directors:* Harvey J. Miller, Walker Metal Products, Ltd.; Robert Spengler, Annex Pattern Co. *Directors re-elected:* Otto Osterman, Redford Iron & Equipment Co.; Roy Grant Whitehead, Claude B. Schneible Co.

Eastern Canada

Chairman, Claude Bourassa, Archer-Daniels-Midland Co.; *vice-chairman,* William C. H. Dunn, Western Pattern Works; *secretary,* Kenneth Scanlon, Canadian Foundry Supplies & Equipment Ltd.; *treasurer,* Willet Tibbetts, Canadian Car & Foundry Co., Ltd. *Directors:* G. B. Perrot, Canada Iron Foundries; Lucien Larose, Robert Mitchell Co. Ltd.; R. J. Young, Dominion Engineering Works Ltd.; Gerald F. Norman, Federated Metals Canada Ltd.; C. Wondolowski, Singer Manufacturing Co.

Eastern New York

Chairman, William C. Stevenson, Rensselaer Valve Co.; *vice-chairman,* Robert W. MacArthur, Ramsay Chain Co., Inc.; *secretary-treasurer,* Sigdon A. Eliot, General Electric Co. *Directors:* Edwin S. Lawrence, General Electric Co.; Norman B. Akitt, Adirondack Foundries & Steel; J. Henry Wheeler, Wheeler Bros., Brass Foundry, Inc.; Charles W. Wright, Eddy Valve Co.

Metropolitan

Chairman, Charles Schwalje, Worthington Corp.; *vice-chairman,* Charles D.

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F. H. Dorndorfer, Sterling Wheelbarrow Co., left, pinning identification badge on Frank Becker, Two Rivers, Wis., right, at the Wisconsin Chapter's Old Timers Night meeting held May 21.—*Photo courtesy Walter Napp, Delta Oil Products Co.*

Groups of members attending the Old Timers Night meeting of the Northeastern Ohio Chapter held on May 20.

Guests at the April meeting of the Birmingham Chapter, held at the University of Alabama, Tuscaloosa, Ala. Left to right, H. A. Lilly, Prof. E. C. Wright, W. D. Stewart, Biddle Worthington, Sinclair Lathem, Dean Cutworth, Edwin E. Pollard.

British Foundrymen Hold 51st Annual Conference

Although clouded by the recent death of secretary Tom Makemson, the 51st annual conference of the Institute of British Foundrymen, held at Glasgow, Scotland, June 22-26, was the largest meeting in the history of the Institute, with 755 members, ladies, and official guests attending.

On the evening of June 22, members and ladies attended a civic reception at the City Chambers, as guests of the Lord Provost and Corporation of Glasgow, with dancing, music, and refreshments provided. In the course of the evening, the Lord Provost welcomed the members and ladies of the conference. President E. Longden and president-elect John Bell responded on behalf of the Institute.

The annual general meeting was held in the rooms of the Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow, on the morning of June 23, president Longden officiating. Mr. Longden preceded the business of the meeting, as he had done at the council meeting of the preceding day, with a tribute to the late Tom Makemson.

New Officers Elected

John Bell was elected president of the Institute at the meeting; and Dr. A. B. Everest and H. J. V. Williams were elected senior vice-president and junior vice-president, respectively. An announcement was also made that George Lambert had been appointed secretary, to succeed Mr. Makemson.

John Bell's presidential address and the 17th Edward Williams lecture, "Engineering Research Methods and Casting

Tom Makemson . . . 1889-1954

John Bell . . . new IBF president

Problems," by Prof. A. W. Scott, terminated the morning's proceedings.

During the morning of the annual general meeting, the ladies divided into groups and visited one of the following factories: J. Templeton & Co., Ltd., carpet manufacturers; Birrell, Ltd., chocolate makers; R. S. McColl, Ltd., confectioners; and City Bakeries, Ltd., bakers and confectioners.

In the afternoon, the technical sessions began, with a series of papers covering most phases of the British foundry industry. One of the features of the meeting was the presentation of the official exchange paper of the American Foundrymen's Society by H. W. Dietert, chairman of the board, Harry W. Dietert Co., Detroit. Mr. Dietert's subject was, "D Process for Precision Castings." His paper is published in its entirety in this issue of American Foundryman (pp. 56-66).

On the evening of June 25, at the Central Hotel, President John Bell, Mrs. A. Taylor, Lord Bilsland (honorary president, conference reception committee), and Lady Bilsland received 635 members, ladies, and official guests at the annual banquet, the largest ever held under the auspices of IBF.

During the evening, W. G. Mochrie, honorary secretary of the London Branch of IBF, ceremoniously piped in "The Haggis" and played a lament for Tom Makemson on the pipes.

Following the "Loyal Toast," immediate past-president Longden proposed the toast of "The City and Corporation of Glasgow," to which Baillie David M. Wardley, senior magistrate of the city of Glasgow, responded. The toast of "The Institute of British Foundrymen" was proposed by Lord Bilsland and was replied to by newly-elected IBF president John Bell. Henry Gardner replied to the toast of "The Guests," which was proposed by Dr. A. B. Everest, senior vice-president of IBF.

On behalf of the members of the Scottish Branch, Prof. A. Campion presented a pair of binoculars to president Bell, in recognition of his outstanding work during the past 30 years as honorary secretary of the Scottish Branch, a post which he had just relinquished.

R. R. Taylor, chairman of the conference executive committee, then announced that with the balance available from the conference fund, which had been subscribed by Scottish industry, it had been decided to establish a John Bell Traveling Scholarship to enable deserving students employed in Scottish industry to take a post-graduate travelling scholarship at the Royal Technical College, Glasgow.

On the morning of June 24, the ladies departed on an excursion to Edinburgh, including a tour of Edinburgh Castle, while members resumed the discussion of the papers presented at the technical sessions. After lunch, visits were made by parties of members to the plants of Glenfield & Kennedy, Ltd.; Clyde Alloy Steel Co., Ltd.; Shanks & Co., Ltd.; Harland & Wolff, Ltd.; and Renfrew Foundries, Ltd.

In the evening, members and ladies attended, at their choice, performances of "Oklahoma," at the King's Theatre; variety at the Empire Theatre; or "The Tommy Morgan Show of 1954," at the Pavilion Theatre.

On June 25, the ladies took part in a tour of the Three Lochs, while members resumed attendance at the technical sessions. In the afternoon, members again visited various plants: G. & J. Weir, Ltd.; John Lang & Sons, Ltd.; Babcock & Wilcox, Ltd.; Mavor & Coulson, Ltd.; and Wm. Beardmore & Co., Ltd.

In the evening, the large number of members and ladies from south of the Border were entertained by a display of Scottish country dancing by the members of the Royal Scottish Country Dancing Society, under the leadership of Duncan Macleod, a feature of the dinner-dance held at the Grosvenor Restaurant.

The conference ended on Saturday, June 26, when over 400 members and ladies enjoyed the traditional cruise to the many beauty spots on the Firth of Clyde, aboard the T. S. "Queen Mary II."

Makemson Obituary

Death of Tom Makemson, secretary of the Institute of British Foundrymen since 1926, occurred suddenly on June 10, 1954. He was born at Workington, Cumberland, England, in December, 1889. Following an apprenticeship as a patternmaker, he joined the British Westinghouse Co. at Manchester, where, in addition to working as patternmaker,

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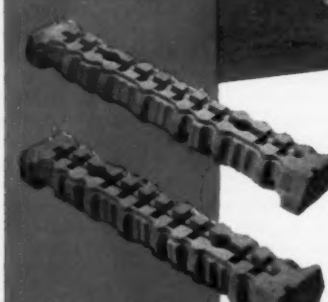
DEMONSTRATED:

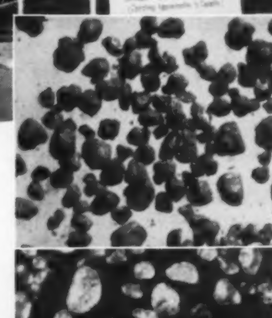
AT THE FOUNDRY SHOW:



• Cores made from new sand (above) and sand reclaimed by National Scrubber (below). Tests indicate the reclaimed sand core is as good as the new sand core, for all production purposes.

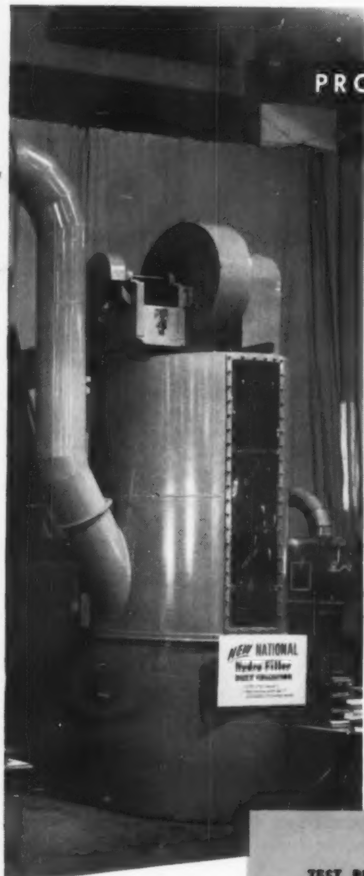
Used Core Sand and Spent Molding Sand . . . RECLAIMED

Here, within the limited confines of an exhibit booth, world foundrymen were given a *production equipment* demonstration of the practicability . . . the real economies of *pneumatic* sand reclamation. Here, waste sand—sand that under normal conditions would be relegated to the dump—was reclaimed, prepared in the new No. 1F Simpson Mix-Muller, and returned to the foundry for use in automotive cores. *Waste* core sand and *spent* molding sand went into the National Scrubber. The resulting sand was, as reported by users, "equal in all important respects to the quality and workability of new sand." (See photographs right and left)



• Photomicrographs of sand before (above) and after reclamation (below) show the difference in National pneumatically scrubbed sand. (Name of foundry on request)

THE MEANS FOR PRACTICAL SAND RECOVERY



PROVED IN USE:

One year's operation—another unit ordered at Locomotive Finished Material Company

Typical of the continuing confidence being evidenced by users of the National Pneumatic Scrubber is the experience of Locomotive Finished Material Company. This Atchison, Kansas, firm is now installing a *second* unit after one year of continuous service with the first Scrubber. Mr. C. E. Akers, Plant Engineer, *tells why* in reporting on a series of 5 tests conducted on new sand versus reclaimed sand:

"You will note that the bonding material additions, including core oil, are exactly the same in both cases. The A.F.S. grain size, clay content, and fines on the reclaimed sand—and the properties of the core sand made from it, are so close to the comparable figures on new sand that we feel the reclaimed sand is just as good as the new sand for all practical purposes . . . We have noticed no difference in casting surfaces between the two."

"The figures given for the reclaimed sand are for an operating rate of 1.4 tons per hour out-put and a recovery of approximately 80%."

Simple in theory and operation, compact and rugged in design, economical in use, the National Sand Recovery System is daily proving profitable and demonstrating that practical sand recovery is within the operating and financial means of foundries. Reports of savings demonstrated in leading foundries all over the country are as close as your National engineer. Call him or write for *Bulletin 512*.

LOCOMOTIVE FINISHED MATERIALS COMPANY
TEST RESULTS: AVERAGE OF 5 TESTS ON NEW & RECLAIMED SAND

SCREEN SIZE	NEW SAND	RECLAIMED
20	.1	.3
30	2.4	1.3
40	21.6	18.4
50	28.9	28.6
70	22.7	26.6
100	18.0	19.9
140	4.2	3.1
200	1.0	.4
270	.3	.0
PAN	.0	.0
TOTAL	99.2	98.6
AFA#	48.9	48.5
CLAY	0.8	0.9

OIL SAND		
ADDITIONS	NEW SAND	RECLAIMED
Sand	800#	800#
Wood Flour	17#	17#
Corn Flour	17#	17#
Core Oil	3 Qts.	3 Qts.
Conditioning Oil	1 Qt.	1 Qt.
SAND PROPERTIES	NEW SAND	RECLAIMED
Moisture	5.8	5.9
Green Strength	3.3	2.8
Permeability	54	65
Dry	175	173
Tensile		

● Write for Bulletin 512, or have your National engineer show you facts and figures on savings realized with the National Scrubber Unit.

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NATIONAL SAND PREPARING & MOLD HANDLING SYSTEMS

SIMPSON *Intensive* MIX-MULLERS

Chapter News

continued from page 80

Preusch, Crucible Steel Co. of America; *secretary*, J. Fred Bauer, Hickman, Williams & Co.; *treasurer*, Wm. H. Ruten, Polytechnic Institute of Brooklyn. *Directors:* Robert D. Bailey, Worthington Corp.; Seymour B. Donner, Cooper Alloy Foundry Co.; Whitney C. Russell, Eastern Foundry Supplies, Inc.; Frederick R. Wiehl, Singer Mfg. Co.

Ontario

Chairman, F. J. Rutherford, Refractories Engineering & Supplies, Ltd.; *vice-chairman*, W. H. L. Bryce, International Harvester Co. of Can., Ltd.; *secretary-treasurer*, Gerald L. White, B. L. Smith Publishing Co., Toronto. *Directors:* E. G. Storie, Fittings Limited; D. B. Herbison, c/o "M" Foundry, Massey-Harris-Ferguson, Ltd.; Alex Pirrie, Standard Sanitary & Dominion Radiator, Ltd.; John R. Morgan, Hamilton Facing Mill Co., Ltd.; M. W. Hollands, General Smelting Co. of Canada; Jack Ramsden, Ramsden Mfg. Ltd.; Theodore Tafel III, Standard Sanitary & Dominion Radiator, Ltd.; John P. Wilkinson, Wilkinson Foundry Facing & Supply Co., Ltd.

CASTING through the Ages

12 Reasons for Using X-Ray in the Foundry

by R. M. Landis, X-Ray Dept., General Electric Company, in the G-E Radiation Digest

The most universally-accepted application for radiography in the foundry industry is the development of pouring practice.

Not every foundry will examine certain lots of castings on a 100 per cent basis, apply x-ray to occasional non-production experimental work, or use it in weld repairs, but every foundry (if it is using x-ray correctly) will use it to develop mold and pouring practice.

Here is a list of reasons for the application of the radiographic method in this field:

1. To investigate and determine the proper position of the gate, risers or feeders, vents and chills; also, to establish their size or number and their proper relative position with respect to one another.
2. To increase the yield and reduce the labor costs by redesign and simplification of the mold so as to reduce the number and size of risers and runners to a practical minimum.
3. To eliminate, where possible, the use of chills, and their accompanying cost, by redesign of the mold.
4. To assist in determining a molding practice to make it possible to pour a casting as near to finished dimensions as possible and to reduce the finished casting weight by the use of cores.
5. To assist in establishing the proper pouring temperature and deoxidizing procedures.
6. To study and determine the proper drying requirements for the mold.
7. To study core problems, such as hardness and/or moisture content.
8. To improve the molding technique to make possible, if desired, substitution of malleable iron in the place of steel.
9. To reduce the time required to determine the soundness of a pilot casting and introduce corrective changes in the molding practice.
10. To encourage employee interest by explaining improvements and results of accomplishments through the showing of films of typical examples.
11. To provide a permanent record of the evolution of specific casting jobs and use this information in new casting practice problems and quality control.
12. To furnish evidence of quality to the sales organization and customers.

Upon analyzing the above, it can be concluded that there are two general goals involved. These are:

(A) To develop a practice which will result in sound castings.

(B) To develop a practice which will economize on the amount of molten metal poured for each casting, reduce machining and scrap costs, and establish the lowest-cost mold and pouring practice consistent with the production of sound castings.

ASTM Elects Officers at 57th Annual Meeting

AMERICAN Society For Testing Materials held its 57th annual meeting at Chicago, June 13-18. Medals and awards were presented, primarily to authors of outstanding technical papers offered during the meeting. Officers were elected for the 1954-55 term. A total of six symposia and 36 technical papers were presented during the week-long meeting.

Throughout the week, the society sponsored its 11th exhibit of testing and scientific apparatus and scientific supplies, and its ninth photographic exhibit, which featured the theme: "Materials, Testing, and Research."

The 28th Edgar Marburg lecture was presented on June 16 by Harold F. Dodge, Bell Telephone Laboratories, Inc. Mr. Dodge, a pioneer in the field of statistics and quality control, spoke on, "Interpretation of Engineering Data."

Beard Is Speaker

Retiring ASTM president Leslie C. Beard, Jr., assistant director, Socony-Vacuum Laboratories, Socony-Vacuum Oil Co., New York, spoke on "Plain Talk." So complex have the sciences become, said Mr. Beard, that a chemist has difficulty understanding a physicist. The scientist and the engineer must be able to communicate with management and the paying public. "This breakdown in communications," he said, "retards invention and stifles the fruits of it."

"Fatigue of Aluminum" was the subject of the third H. W. Gillett memorial lecture, delivered by R. L. Templin, Aluminum Company of America and a past-president of ASTM.

Approximately 600 meetings were held during the week by various ASTM technical committees, several of which have cooperated in developing the technical symposia that featured the program. These latter sessions included symposia on coal sampling, temperature stability of electrical insulating materials, odor, permeability of soils, effect of cyclic heating and stressing on metals at elevated temperatures, and methods of testing building constructions.

Norman L. Mochel, manager, metallurgical engineering, Westinghouse Electric Corp., Philadelphia, was elected president of ASTM for the new term of one year. Mr. Mochel was formerly vice-president of the society, and a director for two separate terms.

Elected for a two-year term as vice-president, Rudolph A. Schatzel, vice-president and director of engineering, Rome Cable Corp., Rome, N. Y., has been particularly active in ASTM in studies of rubber and rubber-like materials.

Five new members were elected to the society's board of directors, each for a three-year term. They were: E. J. Albert, president, Thwing-Albert Instrument Co., Philadelphia; J. M. Campbell, research laboratories division, General Motors Corp., Detroit; P. V. Garin, test engineer, Southern Pacific Co., San Francisco; J. H. Jenkins, chief, Forest Products Laboratories of Canada, Ottawa, Ont.; and D. E. Parsons, chief, building technology division, National Bureau of Standards, Washington, D. C.

The Charles B. Dudley medal was awarded to C. E. Work and T. J. Dolan, University of Illinois, Urbana for a paper, "The Influence of Strain-Rate and Temperature on the Strength and Ductility of Mild Steel in Torsion," presented at the 1953 meeting. The C. A. Hogentogler Award went to A. A. Wagner, Bureau of Reclamation, Denver, Colo.; Richard L. Templin Award: E. T. Wessel and R. D. Olleman, metallurgical and ceramic department, Westinghouse Electric Corp., East Pittsburgh, Pa.; Sam Tour Award: J. T. Richards, Penn Precision Prods., Inc., Reading, Pa.

ASTM committee D-19 on industrial water established the Max Hecht Award, in honor of its first chairman. The initial presentation, at the 1954 meeting, went to Mr. Hecht, adviser, Power Stations Chemistry, Drexel Hill, Pa., for outstanding service to the committee.

The Frank E. Richart Award, for outstanding contributions in the field of concrete and concrete aggregates, established also in 1954, was presented to A. T. Goldbeck, National Crushed Stone Assn., Inc., Washington, D. C.

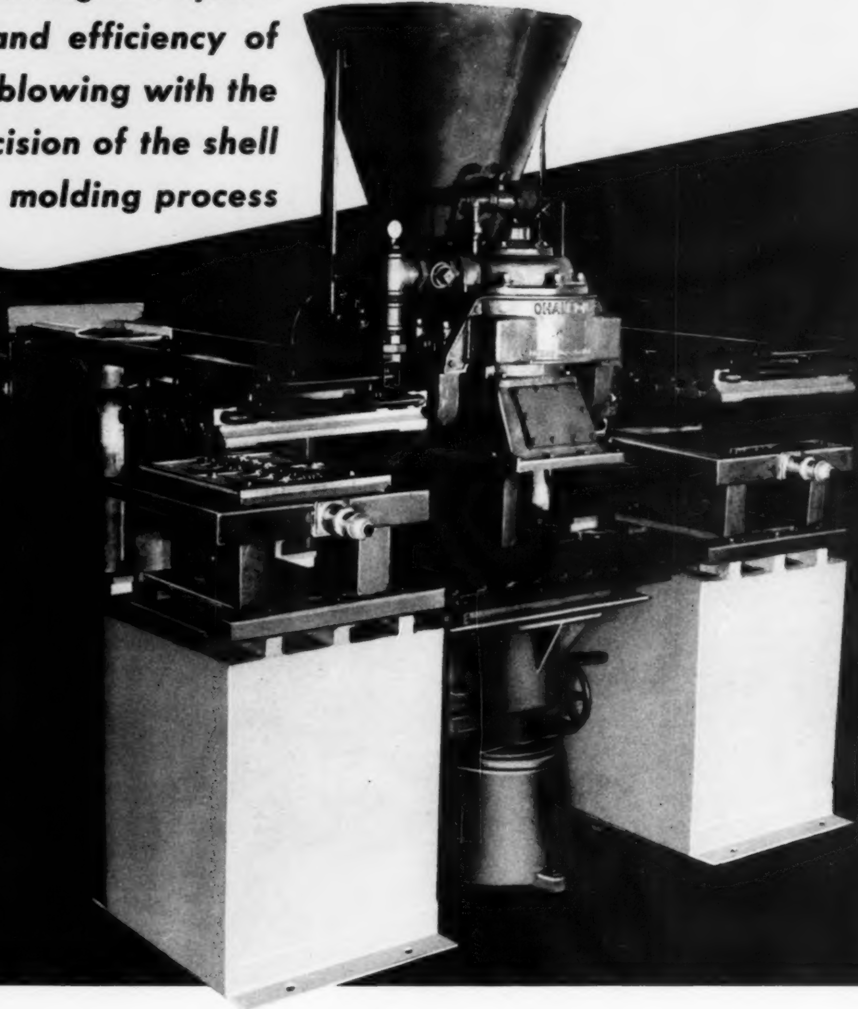
Finally, ASTM honored eleven technical leaders in the field of engineering materials who have rendered outstanding service to ASTM, particularly in technical committee work. They received Awards of Merit and were: H. A. Anderson, Western Electric Co., Chicago; B. A. Anderton, Barrett Div., Allied Chemical & Dye Corp., Edgewater, N. J.; James Aston, A. M. Byers Co., Pittsburgh, Pa.; R. F. Field, General Radio Co., Watertown, Mass.; O. M. Hayden, E. I. du Pont de Nemours & Co., Wilmington, Del.; E. F. Kelley, Physical Research Branch, Bureau of Public Roads, Department of Commerce, Washington, D. C.; G. M. Kline, Division of Organic and Fibrous Materials, National Bureau of Standards, Washington, D. C.; S. S. Kurtz, Jr., Research and Development Dept., Sun Oil Co., Marcus Hook, Pa.; E. E. Thum, editor, *Metal Progress*, American Society for Metals, Cleveland; Sam Tour, Sam Tour & Co., Inc., New York; and H. L. Whittemore, retired chief, Engineering Mechanics Section, National Bureau of Standards, Washington, D. C.

F. E. F. Board of Trustees Meet in Cleveland

Attending the F.E.F. Trustees Meeting in Cleveland during the AFS Convention in May are standing, left to right: Robert Watts, American Brake Shoe Co.; C. V. Nass, Beardsley & Piper Div., Pettibone-Mulliken Corp.; H. G. Robertson, American Steel Foundries; L. J. Wise, Chicago Malleable Castings Co.; T. H. Shartle, Texas Electric Steel Castings Co.; F. X. Bujold, Ford Motor Co.; George K. Dreher, Waukesha, Wis.; T. B. Belfield, Cochrane Foundry Co.; J. T. MacKenzie, American Cast Iron Pipe Co.; W. R. Tanner, Zenith Foundry Co.; J. B. Fleeger, Oklahoma Steel Castings Co.; and M. J. Allen, American Steel Foundries. Sitting, left to right: E. C. Hoenicke, Eaton Manufacturing Co., FEF vice-president; Thomas Kaveny, Jr., Herman Pneumatic Machine Co., president; E. M. Knapp, Ferro Machine & Foundry Co., secretary-treasurer; and E. J. Walsh, executive director, Foundry Educational Foundation.

SHELL BLOMATIC

combining the speed and efficiency of blowing with the precision of the shell molding process



The new B&P shell Blomatic units now make possible the production of precision shell molds on a core blower type unit, with all of the speed and efficiency of the blower type of operation. In a shell Blomatic unit a B&P Champion blower replaces the sand box equipment used with B&P shell Formatic units. Instead of a rainfall of shell molding sand onto the pattern, sand is blown into a box. A few of the advantages of the shell Blomatic type of operation are:

1. Higher production.
2. Controlled contour of back of shell to permit use of clamp type pouring fixtures, eliminating backup material.
3. Thinner shells.
4. Simpler production cycle.

The shell Blomatic units feature the same unit package design of the shell Formatic units. A foundry may start with the simple components shown above—blower, curing furnace, and stripping unit—and later incorporate them in a complete rotary automatic unit. The cost of the simplest type of installation is only a small amount more than that required for very crude dump box installations. Yet, production cycles of two shells per minute are possible and the simple components offer all of the quality features so essential to successful shell molding. Write for full information. *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

FEMA

Foundry operated by Best Manufacturing Co. (left) in 1904, same year in which Benjamin Holt tested the first commercially-successful crawler tractor. (Right) Caterpillar Tractor Company's present, modern foundry, now pouring more than 600 tons per day.

Caterpillar Observes Fiftieth Anniversary

THE role of the crawler tractor in the past half-century of economic development will be emphasized this year with the 50th anniversary of the first commercially-successful track-type tractor, built in 1904 by Benjamin Holt, who later joined with C. L. Best to form Caterpillar Tractor Co.

Through the years, the company has pioneered new manufacturing techniques and developed modern manufacturing facilities which have kept it in the forefront in the production of basic industrial equipment. Typically, the Caterpillar foundry has boosted its production capacity from 275 tons per day to slightly more than 600 tons per day. Frank Shipley, foundry manager, who has been part of the foundry's administration since its first pour on January 14, 1930, explains with pride that this more-than-doubled capacity has been achieved without increasing the production space.

Actually, both parent companies, Holt and Best, operated foundries before Caterpillar's organization in 1925 under its present name. However, the foundries were of comparatively small size and limited production. In neither company was there sufficient foundry production to meet manufacturing needs. As a result, heavy castings were purchased from vendors.

The practice of purchasing castings continued in the newly-organized Caterpillar Tractor Co. Stringent quality controls, however, made procurement of satisfactory castings increasingly difficult, resulting in the decision to build a company foundry. Although the first castings of engine blocks and transmission housings were for gasoline tractors, the new Caterpillar foundry poured iron for diesel engine blocks before it had been in operation a year.

Requires More Precision

Foundry work for manufacture of diesel engines requires even more meticulous precision than for gasoline engines because of the higher temperature at which diesels operate. But Caterpillar's foundry was ready to go into production when the decision was made to place diesel power machinery on the market under the Caterpillar trade mark.

Prompt public acceptance of the fuel-saving diesel engine put a heavy load on the foundry, but the challenge was met through the ensuing years, without expanding the foundy area. Expansion was avoided by the expedient of careful planning and persistent testing of new methods and new machines which might increase efficiency without increasing space requirements.

Use of core blowers, mechanization of the cylinder block line, improved molding machine designs, and development of techniques to improve the quality of liners and cylinder heads all went into the development of the Caterpillar foundry.

Tougher, stronger and still machinable iron has been the result of continuing efforts to improve the company's product. At the Caterpillar foundry, for instance, pioneering in metallurgy brought out the value of extensive use of chrome, nickel and molybdenum. It upped the impact value of the iron—an important consideration in the manufacture of crawler tractors.

Throughout all industry, there has been an increasing awareness of the importance of safety. Recent National Safety Council figures show a lost-time frequency in all reporting industries of 8.4 lost-time accidents per million man-hours worked. In all foundries reporting, the average is 13.93 per million man-hours worked. Caterpillar's records show a foundry safety record with an index of only 5.0 lost-time accidents per million man-hours worked.

During the war, the government asked Caterpillar to make aluminum cylinder heads for radial tank engines. Casting of cylinder heads, with their fluted exteriors to facilitate air cooling, has been a slow process, involving much manual work.

Caterpillar engineers, in the same hurry that marked all emergency war planning, designed an aluminum foundry which the company built and placed into operation in record time. The new foundry produced cylinder heads at a rate above that of any previous plant of equal size, and did it with women in its labor force. The only men in the new foundry functioned in a supervisory capacity. The foundry has been dismantled, but it is still remembered by Army officers charged with the responsibility of keeping Allied troops adequately armed.

Foundry Tradenews

Purchase of the resin division of **U. S. Industrial Chemicals Co.** was announced by **Archer-Daniels-Midland Co.,** Minneapolis. The transaction involves plants at Pensacola, Fla., and Newark, N. J.

The locomotive crane division and plant of **Browning Crane & Shovel Co.,** Cleveland, has been acquired by **Wellman Engineering Co.,** Cleveland, manufacturer of heavy-duty materials handling equipment.

Sterling Wheelbarrow Co. celebrates its 50th anniversary this year. Originally established in 1896, the company was reorganized in 1904 by Thomas L. Smith, who remained as president until 1920. Irving R. Smith then succeeded to the presidency, which he held until 1953, when Richard A. Smith was elected to that office. Sterling makes a specialized line of wheelbarrows, flasks, casting trucks, and other foundry equipment.

Shakopee Foundry Co., new name of the 70-year old **Salgite Foundry Co.,** Shakopee, Minn., will be operated as a gray iron jobbing and drainage fittings shop by its new owners: J. E. Quest, president; and C. F. Quest, secretary-treasurer. Arnold Salg, former president, will be vice-president and general manager. In addition, C. F. Quest is president, and J. E. Quest secretary-treasurer of J. F. Quest Foundry Co., and they are co-owners of Quest Mfg. Co., both in Minneapolis.

Richardson Scale Co., Clifton, N. J., manufacturer of industrial weighing and materials handling equipment, has opened a new branch office at 211½ Court Ave., Memphis, Tenn., where Gus Baurnfind will be branch manager. The Atlanta branch office, with E. C. Mott as manager, has moved to 423 Grant Building, Atlanta, Ga.

PMS Co., Cleveland, was recently purchased by Mrs. G. G. Barber and Mr. G. R. Rusk of Toledo, Ohio, also owners of Freeman Supply Co. PMS has been producing pattern shop supplies for approximately ten years.

National Safety Council has announced nine awards for outstanding plant safety to **Reynolds Metals Co.,** including one award of honor, six awards of merit, one certificate of commendation, and one president's letter. The awards were presented for outstanding achievement in accident prevention in Reynolds plants.

Shieldalloy Corp., New York, has appointed **Industrial Foundry Supply Co.,** San Francisco, as exclusive sales agents for the complete line of Shieldalloy products in Northern California. In Southern California, the line will be handled by **Gordon Sondraker & Co.,** Maywood, Calif.

August 1 was the scheduled completion date for a new 15,000 sq ft plant being constructed at 2270 Noblestown Rd., Pittsburgh, Pa., for the **Foxboro Co.** of Foxboro, Mass. The new building is being erected for the instrument manufacturing concern on two levels in steel, masonry, and brick exterior.

Meehanite Metal Corp., New Rochelle, N. Y., has closed a contract with **Blackmer Pump Co.,** Grand Rapids, Mich., which will allow the latter firm to produce Meehanite castings in their foundry for use as component parts in a full line of industrial pumps.

Arthur D. Little, Inc. of Cambridge, Mass., has acquired the research and development division and laboratories of **Merrill Co.,** a metallurgy and engineering firm of San Francisco. The new facilities will be known as the **Western Laboratories Div.** and will make research and product development by ADL conveniently available to West Coast industry.

A. P. Green Fire Brick Co., Mexico, Mo., has purchased **Liptak Furnace Arches, Ltd.,** 68, Victoria St., London, S. W. I., England, Refractory products manufactured by Liptak at its Manchester (Eng.) factory include high temperature bonding mortars, plastic firebrick, and refractory castables, all made under the American formulas and supervision of the A. P. Green laboratories.

American Air Filter Co., Inc., Louisville, Ky., has purchased the entire plant and equipment of **Ice Cooling Appliance Corp.,** Morrison, Ill. The 152,000 sq ft Morrison plant will be operated by the **Herman Nelson Div.** of American Air Filter, which produces heating and ventilating equipment for schools, industrial, commercial, and institutional buildings.

General Electric Co. will begin construction during 1954 of a new $5 million plant at Shelbyville, Ind., to manufacture industrial furnaces, induction heating equipment, and other heating devices. Located on a 50-acre site, the new plant will accommodate manufacturing operations now centered at Schenectady, N. Y., and Pittsfield, Mass.

Whiting Corp., Harvey, Ill., reported the highest net income in its 70-year history for the fiscal year ended April 30, 1954. The firm, internationally-known for its overhead cranes, foundry, railroad, chemical processing, and aviation equipment, earned a net income of $829,743.

Battelle Memorial Institute, Columbus, Ohio, has purchased a 397-acre plot of land 15 miles from downtown Columbus, continuing the expansion program that has seen the organization grow to a staff of 2150 and a research dollar-volume of $13.5 million in 1953.

Zenith Foundry Co., Milwaukee, describes its quality-controlled operations in an 18-page booklet recently published. Illustrations show every phase of Zenith sand testing and control, and metal melting control processes.

A new technical booklet consisting of 11 reference sheets covering the major stainless alloys has been published by **Cooper Alloy Foundry Co.,** Hillside, N. J. For each alloy the following information is given: chemical composition, mechanical and physical properties, resistance to major corrosive solutions, machinability, heat treatment, and weldability. Copies will be furnished upon request.

Cast Six "Thimbles" for Oregon

Cinder pots, manufactured by Mackintosh-Hemphill Co., are being loaded upside down on a flat car for shipment from Midland, Pa., to the new nickel plant of Hanna Nickel Smelting Co. at Riddle, Oregon. At Hanna, the 50-cu. ft. capacity cast steel pots will be used to carry slag from electric smelting furnaces. Specially designed for the slag-carrying job, the pots have corrugated sides which eliminate distortion by the hot molten slag. Loops are tilting lugs made of cold-rolled steel bars cast integral with the rest of the pot. Lifting trunnions on the sides of the pots are also integral parts of the castings.

USE THIS NEW, FAST WAY
...to handle Ferro-Alloy briquets in your foundry

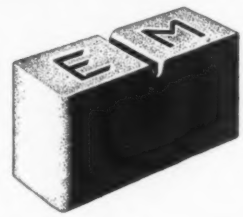
"EM" briquets can be stacked and shipped on pallets for convenient, fast handling. The pallets hold 4000 lb. of briquets and are available at no extra charge over bulk shipments. They can easily be unloaded and handled in your plant by lift truck or overhead crane. Handling time and costs are substantially reduced, and inventory-taking is simplified. The pallets are expendable and need not be returned.

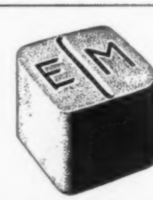
In addition to pallets, shipments in bulk or in 250-lb. bags are available for those who prefer delivery in this manner.

Contact the nearest ELECTROMET office for further information on how you can save with "EM" briquets.

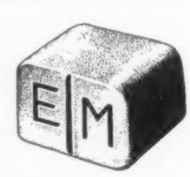
The terms "Electromet" and "EM" are registered trade-marks of Union Carbide and Carbon Corporation.

SILICON





SILICOMANGANESE



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Round Table Discussions Feature MFS Meeting

C. E. Brust . . . heads MFS

HERBERT F. SCOBIE / *Editor*

ROUND table discussions led by the retiring and the new president highlighted the annual meeting of the Malleable Founders' Society held June 14 and 15 at the Seigniory Club, Montebello, Que., Canada. George T. Boli, Northern Malleable Iron Co., St. Paul, Minn., retiring MFS president, conducted a session the first day directed at increasing sales efficiency. On the second day, C. E. Brust, Eastern Malleable Iron Co., Naugatuck, Conn., who had been installed as president the night before, presided at a round table on business conditions and plant advances.

New officers installed at the annual banquet in addition to Mr. Brust are C. L. Liebau, Federal Malleable Co., West Allis, Wis., vice-president, and Dudley V. Walker, Eberhardt Mfg. Div., Eastern Malleable Iron Co., Cleveland, treasurer. Recipient of the McCrea Medal was John A. Wagner, Wagner Malleable Iron Co., Decatur, Ill. Presentation was made by Cal C. Chambers, Texas Foundries, Inc., Lufkin, Texas.

Mr. Boli, who presided the first day, opened the meeting with his presidential address. He reported on the success of the MFS promotional campaign which included during 1953-54: advertising in periodicals, four sales clinics, and a market development conference. He suggested that the organization investigate welding of malleable, specifications and properties of malleable, and sales promotion of pearlitic.

Review Committee Activities

Committee activities of MFS were reviewed in the annual reports of committee chairmen or their representatives. Mr. Liebau urged continuation of Education Committee activities, particularly distribution of "The Malleable Foundry and You," and information on malleable castings, to students. Reporting on behalf of Wm. Scott Roby, Peoria Malleable Casting Co., Peoria, Ill., and the Advertising Committee, Liebau stated that the organization's advertising program (four times a year in each of five periodicals) was paying off and that it was the minimum program desirable. A 50 per cent increase in the appropriation for advertising was recommended.

Lowell D. Ryan, MFS managing director, reported for the Cost Accounting Committee while W. H. Moriarty, National Malleable & Steel Castings Co., Cleveland, gave the Finance Committee report. In presenting the report of the Government Affairs Committee for R. N. Cole, Canton Malleable Iron Co., Canton, Ohio, C. M. Lewis, Badger Malleable & Mfg. Co., South Milwaukee, Wis., stated that the committee had protested scrap exports with some success. Paul H. Vincent, Erie Malleable Iron Co., Erie, Pa., pointed out on behalf of Handbook Committee Chairman H. E. Steinhoff, Wagner Malleable Iron Co., Decatur, Ill., that work was progressing on all chapters, and said that ideas and material believed properly included should be sent in promptly.

Sales Clinics Well Attended

T. A. Scanlan, Eastern Malleable Iron Co., reported that the four sales clinics and the conference staged by the Market Development Committee had been well attended and had promoted extensive discussion of practical methods of solving sales problems. The committee is developing a standard billboard to be used near plants and at plant entrances, he said. He urged continued use of the MFS color-sound movie, *This Moving World.* Mr. Boli read the report of the late R. N. Hoffman, Michigan Malleable Iron Co., Detroit, on membership. Mr. Chambers outlined the safety program carried on by the Personnel & Plant Operations Committee and stated that the accident rate in MFS-member foundries was lower than in the foundry industry in general.

Ralph T. Rycroft, Kencroft Malleable Co., Inc., Buffalo, N. Y., in presenting the report of the Research & Product Improvement Committee in behalf of G. J. Behrendt, Eastern Malleable's Naugatuck Malleable Iron Works, Naugatuck, Conn., said that plans were underway to assist member plants in applications of principles developed in the current research project on gating and feeding. W. A. Kennedy, Grinnell Co., Inc., Providence, R. I., reported for the Technical Council.

James H. Lansing, MFS technical and research director, briefed the meeting on current research entitled *"Further Studies of Castings Fed by a Single Blind Feeder."* The project, in its third stage, was carried out at Cornell University, he said, as well as in a number of MFS-member plants. During the work, solid and cored cylinders, cast vertically and horizontally, were gated at several locations. A hollow cylinder, closed at one end like a piston, was cast in the cope, in the drag, and horizontally.

Cylinders and plates were cast to determine feeding distances. Other factors reported were effect of gate size and shape, effect of pouring rate, and use of a single feeder for several castings. On the basis of the investigation, values were assigned to volume ratio: solidification ratio curves for top and side feeding of solid castings, and side feeding of cored castings.

Mr. Boli, F. O. Parker, Dayton Malleable Iron Co., Dayton, Ohio, and R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., participated in a discussion of *"What the Malleable Industry Can Do to Increase Sales Efficiency."*

Mr. Boli emphasized the value of constructive methods and told how to create a staff of sales engineers who can help customers redesign existing jobs, or design new jobs for malleable and pearlitic. He recommended putting sales trainees through a shop program to acquaint them with the factors that influence cost and quality. After about five months, the trainees go into the sales department where they learn the routines before going out into the field with customer contact men (non-engineering salesmen).

Told to Work on Conversions

His sales engineers are told to work on conversions, Boli said, not on jobs already being done in malleable. They are instructed to go beyond the purchasing agent to the engineering and production departments. It takes about nine months for a new sales engineer to start showing results and bring in a good volume of conversions (see page 32). The customer respects the sales engineer and both the purchasing and the engineering departments look to him for advice.

There is no engineering substitute for castings, Mr. Gilmore said, pointing out that there is no other way to put metal where it is wanted so accurately at so little cost. He described his company's stress analysis laboratory which makes

continued on page 94

MFS Meeting

continued from page 93

measurements in millionths of an inch both statically and dynamically and at frequencies up to 60,000 cycles per second. His men aim at producing castings with built-in feeding systems and yields of 80 to 90 per cent.

The salesman who brings in the most inquiries regarding conversions each month receives a $100 cash award, Gilmore said. Other sales aids include an annual two-day sales clinic for sales representatives and a casting production and design clinic for engineers of customers. Visit all types of equipment exhibits, Gilmore advised in search of opportunities to develop business. He advised also watching equipment advertisements for job possibilities, and for derogatory statements regarding castings that might be made by manufacturers. These should be challenged, he said.

Mr. Parker outlined the problems of retraining salesmen who have had no trouble overselling foundry capacity in recent years and now face a buyer's market.

Outline MFS Program

Incoming President Brust opened the second day of the meeting with an outline of the MFS program for the coming year. Research and product improvement activities will be continued through cooperative work in member plants but without outside assistance, he said. The Technical Council will study production of heavy sections without primary graphite and will also develop more information on basic properties of malleable and pearlitic. Shop practice sessions will be conducted regularly, he stated, and a study will be made to develop more accurate cost accounting methods.

Sales clinics of the past year have been considered highly successful and will be continued, Brust declared. The advertising program had Board approval and would be continued, he said. The 6th Market Development Conference will be staged in 1955 while the new handbook in malleable iron was expected to be well along toward completion by the end of 1954. Two new committees were being established, he said. The Pearlitic Committee will develop information for the use of specification-making bodies, while the Welding Committee will accumulate information on applications in which malleable iron is welded.

Dudley V. Walker presented his report as incoming treasurer, followed by Lowell D. Ryan, managing director, who suggested in his annual report that there was a need for an executive training program to provide the malleable industry with top personnel for administrative and sales work.

The remainder of the session was devoted to a discussion of business conditions and plant advances, led by President Brust, and an address by Lee C. Shaw, Seyfarth, Shaw & Fairweather, Chicago, entitled *"Should the Malleable Industry Play Follow the Leader in Labor Relations."*

Collins L. Carter and T. T. Lloyd, Albion Malleable Iron Co., Albion, Mich., showed a new color-sound film of operations at Albion, prepared to show customers what is required to produce a casting.

In discussing cost reduction, Mr. Walker described Eastern Malleable's Cost Committee consisting of two men from each of the company's five plants. Head of the committee is an assistant manager, secretary is the company secretary. The committee meets in a different plant every two months and goes into every phase of company operations except sales. Committee members develop savings programs, estimate the savings anticipated per year, then follow up to determine whether the savings actually materialize.

Trainees Turn in Reports

Commenting in Eastern's two-year training program, Walker said the trainees turn in periodic reports to the chairman of the board. The company is more interested in developing in the trainees the habit of thinking than in immediate practical value that their ideas might have, he declared.

James H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Michigan, reported that use of boron had enabled his company to reduce annealing cycles about 25 per cent. He emphasized the value of a special staff in each plant devoted to developing better methods and simpler work routines.

Vice-President Liebau cited the gains in scrap reduction brought about by a concerted scrap control drive and pointed out the value of accounting procedures that provide rapid cost figures, preferably within 24 hours.

H. W. Streeter, Lehigh Foundries, Inc., Easton, Pa., declared that changing from a solid to a shell core on one job had eliminated purchasing and processing of 1000 tons of core sand.

New AFS Manuals

"Engineering Manual for Foundry Health Control," Section 2 and Section 3, have recently been printed by AFS under the guidance of W. N. Davis, Director of Safety, Hygiene and Air Pollution Control Program of the Society and are now available.

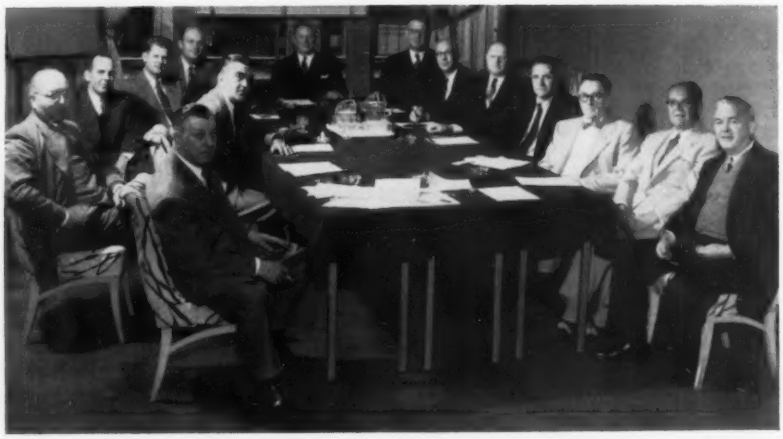
Section 2 deals with Practical Design of Sand Handling Ventilation Systems and covers standard exhaust applications encountered in a mechanized foundry. It was prepared as a practical guide in the selection and application of air volumes necessary for the proper control of dust and fumes.

Gives Basis of Design

Section 3 covers Exhaust System Design and gives a choice of design procedure, basis of design, the nomograph as an aid in pipe design. An example of system designed by the nomograph method is included.

Booklets will be followed by supplemental information whenever it becomes available, and each manual is priced at $1.00 to members of the Society and $1.50 to non-members.

Committee of Exhibitors Meets in Chicago



Exhibits Committee met at the Drake Hotel, Chicago, June 4, to review the 1954 Foundry Congress and Show and reviewed recommendations made regarding the 1956 Show. From left to right: J. A. Gitzen, Delta Oil Products Co.; B. L. Simpson, AFS vice-president; C. A. Sanders, American Colloid Co.; H. J. Niemann, The Hydro-Blast Corp.; A. A. Hilbron, AFS exhibits manager; F. A. Pampel, Chain Belt Co.; C. L. Carter, AFS past president; L. L. Andrus, American Wheelabrator & Equip. Co.; Thos. Kaveny, Jr., Herman Pneumatic Machine Co.; R. L. McIlvaine, National Engineering Co.; E. F. Kindt, Kindt-Collins Co.; L. H. Heyl, Federal Foundry Supply Co.; V. F. Stine, Pangborn Co; and Wm. W. Maloney, AFS secretary-treasurer and general manager.

Makemson Death

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he taught foundry and pattern shop apprentices in the works school, eventually doing full-time work in the education department of the company. He was later transferred to the research department of the organization, which had become the Metropolitan Vickers Electrical Co.

Makemson joined IBF in 1917 and early in 1922 was elected honorary secretary of the Lancashire branch. In 1926, he was appointed secretary of the Institute, a post which he combined with the secretaryship of the Manchester Association of Engineers. Under his guidance, the Institute's activities in both national and international fields were greatly enlarged, and the membership was increased from 1600 to 5200 during his long term in office. During the war he worked with the Iron and Steel Control group of the government's Ministry of Supply, being successively deputy director, joint director, and director for iron castings. For this service, he was awarded the M.B.E.

Tom Makemson was well equipped for his work with IBF, with his outstanding capacity for hard work, enthusiasm, and sympathetic interest in young foundrymen and their problems. He had a wide circle of friends in the foundry and engineering industries. Because of his work as secretary of the International Committee of Foundry Technical Associations, a post which he held from its formation in 1926, he was well-known and highly respected in Europe and America, as well as Britain.

Funeral services were held at the Manchester Crematorium, Barlow Moor Road, Manchester, England, on June 14. A large number of his friends attended, including many officers and members of the Institute.

Publish Research Booklet

Armour Research Foundation has published a booklet entitled "Foundry and Steelmaking, A Research Service for Industry." Booklet describes the Foundation's foundry and steelmaking facilities and activities and its service to industry. Past projects are listed and a history of the Foundation's growth are included. Copies may be obtained from Armour Research Foundation, Illinois Institute of Technology, Chicago 16, Ill.

Revise High-Alloys Designations

First revision since 1951 of the standard designation list covering the most popular grades of nickel-chromium alloys used for heat and corrosion resistant castings has just been published by the Alloy Casting Institute, Mineola, N. Y.

Wallis Honored by Penn State

W. B. Wallis (right), president, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa., is presented the distinguished alumnus award of Pennsylvania State University by the institution's president, Dr. Milton S. Eisenhower in ceremony on the campus at State College, Pa. Mr. Wallis received the award for his outstanding achievement as an industrial leader since his graduation from the university in 1911. He is a Past-President of American Foundrymen's Society (1948-49) and is currently president of Foundry Equipment Manufacturers' Association. He was awarded the Founder's Jewel by the Electric Metal Makers Guild in 1952 and is very active in church, fraternity and alumni work.

Chapter Meetings

August

7 . . Canton
Alliance Ohio, Alliance Country Club. Picnic.

7 . . Chicago
Crete, Ill. Lincolnshire Country Club. Stag Outing & Golf.

14 . . Southern California
Lakewood Country Club. 19th Annual Summer Picnic.

Washington
5 Mile Lake. Annual Outing.

Research Directory Issued

Case Institute of Technology's second research directory just issued covers work active between June 30, 1953, and March 1, 1954. Included are 33 metallurgical projects, a number of which directly relate to the foundry industry.

Projects are listed according to the department in which the work, or a major part of it, is being conducted. Each project carries a code identification to facilitate inquiries, a title, and a brief summary of the investigation. Requests for the directory and for information on the projects listed should be directed to the Industrial Liaison Officer, Case Institute of Technology, University Circle, Cleveland 6, Ohio.

A.S.T.E. Elects Officers

Joseph P. Crosby, LaPointe Machine Tool Co., Hudson, Mass., was elected president of the American Society of Tool Engineers, succeeding Roger F. Waindle, Wai Met Engineering Co., Muskegon, Mich.

Elected with Crosby were: Dr. H. B. Osborn, Jr., Ohio Crankshaft Co., Cleveland, first vice-president; H. C. McMillen, Bedford, Ind., second vice-president; and H. E. Collins, Hughes Tool Co., Houston, Texas, third vice-president.

R. C. W. Peterson, Peterson Engineering Co., Toledo, Ohio, was elected treasurer; Wayne Ewing, Arrowsmith Tool & Die Co., Los Angeles, Calif., secretary; and Harold D. Long, Scully-Jones & Co., Chicago, assistant secretary-treasurer.

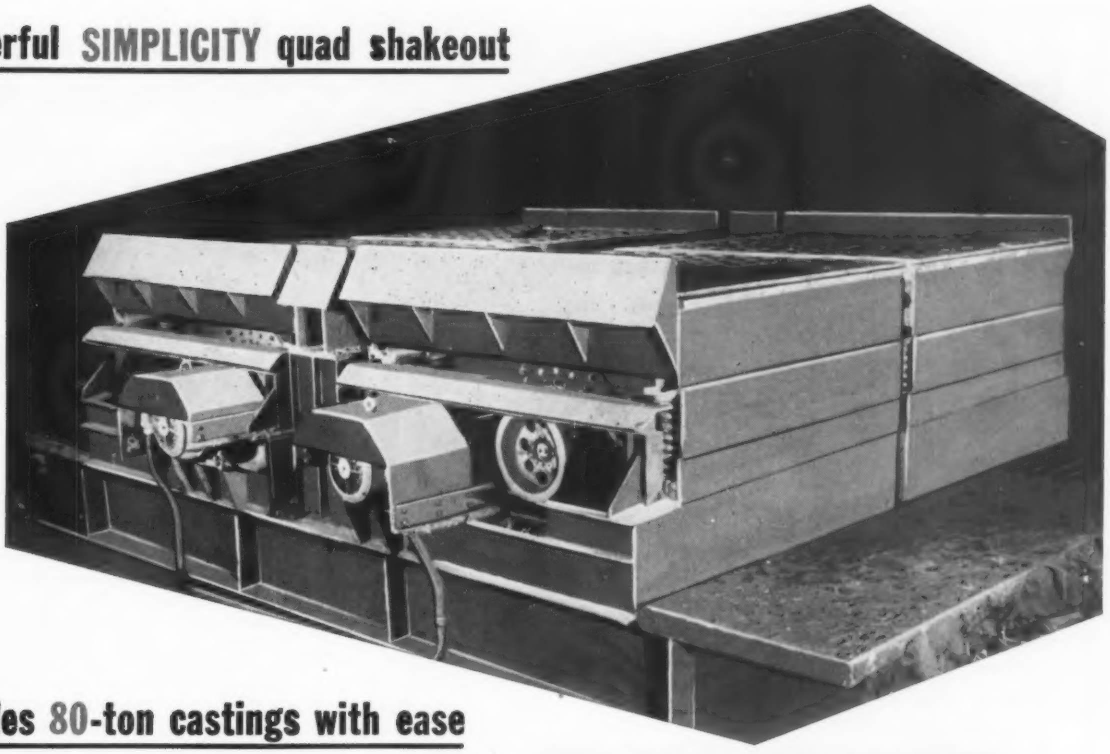
Obituaries

Henry D. Sharpe, chairman of the board, Brown & Sharpe Mfg. Co., died on May 17.

Walter J. Langston, board chairman, Canada Iron Foundries, Ltd., Montreal, Que., Can., died suddenly on April 16.

After eight years of retirement, **Wm. M. Carty** died on May 19. He was formerly affiliated with Standard Brake Shoe & Foundry Co., Pine Bluff, Ark.

Powerful SIMPLICITY quad shakeout

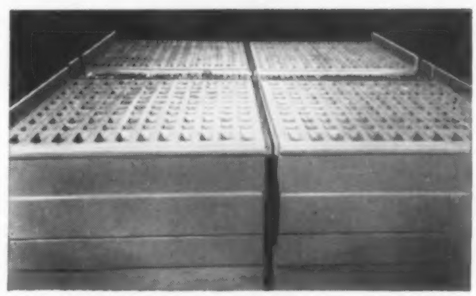


handles 80-ton castings with ease

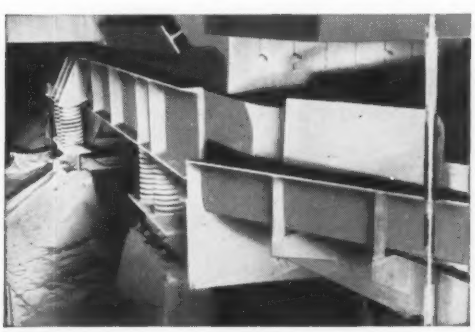
This is the Simplicity spring-mounted quad shakeout, made up of four 7' x 8' steel-decked Simplicity Model OM units, that is handling huge 80-ton tank hull castings for a well-known foundry.

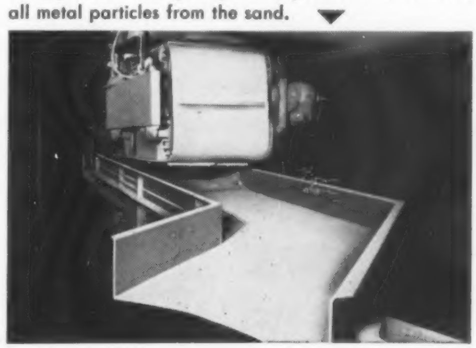
After plenty of pounding by the big 80-ton castings, the deck of the Simplicity unit is still in sound condition. Controlled vertical vibration, concentrated at the deck, eliminates travel of flasks and castings and does a more thorough shakeout job in less time.

In the same foundry, a 4' x 20' Model OA Simplicity Feeder, installed under a hopper beneath the shakeout, feeds sand to the return conveyor for reclaiming without hang-up or bridging in the hopper.



This 3' x 20' Simplicity Model VS Conveyor, connected to the Simplicity Feeder, insures the smooth, even flow of sand back to the reclaiming unit. It is equipped with a Dings self-cleaning magnetic separator that removes all metal particles from the sand.





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Sales representatives in all parts of the U.S.A.
FOR CANADA: Canadian Bridge Engineering Company Ltd., Walkerville, Ontario
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND, MICHIGAN

Abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the complete articles briefed below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage. Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

A490 . . **"High Temperature Melting and Pouring of Gray Iron,"** Koichino Kagami, *Fonderia*, vol. 2, no. 11, November 1953, pp. 457-460 (in Italian). Whereas in the United States the founding of cast iron takes place at temperatures exceeding 1500 C, in Japan these operations are performed at about 1400 C. Since the use of higher temperatures involves economic burdens, the author wanted to determine the advantages that may justify such additional expenses. By testing the materials obtained at different temperatures he found that, while the somewhat greater hardness of the product obtained at the higher temperature is only indirectly attributable to the latter, its lower porosity and higher resistance to the hydraulic test are certainly produced by the higher temperature of the operations.

A491 . . **"Annealing of White Iron,"** A. Hultgren and G. Osterberg, *Iron and Steel* (British), vol. 27, no. 7, June 12, 1954, pp. 272-282. The authors report on experiments to determine rates of graphitization of white irons during annealing, and the relative proportions of spherulitic and non-spherulitic types formed.

A492 . . **"The Growth of Nodular Graphite,"** M. Hillert and Y. Lindblom, *Iron and* Steel (British), vol. 27, no. 7, June 12, 1954, pp. 295-296. A theory for the growth of graphite nodules by means of screw dislocations is suggested. The theory involves the trapping of foreign atoms within the growing graphite crystal so that a uniform dispersion of these elements is present in each nodule.

A493 . . **"Undercooled Graphite,"** H. Morrogh and W. J. Williams, *Iron and Steel* (British), vol. 27, no. 7, June 12, 1954, pp. 302-304. Evidence is presented to support the view that undercooled graphite in cast irons and alloys arises from the decomposition of a carbide. Several practical examples are offered.

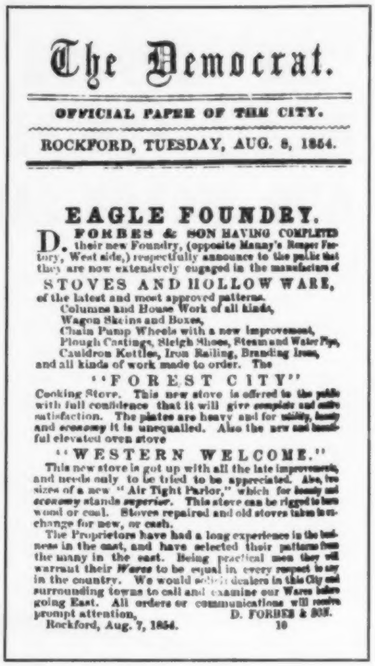
A494 . . **"Solidification of Fe-P-C Alloys,"** H. Morrogh and P. H. Tutsch, *Iron and Steel* (British), vol. 27, no. 7, June 12, 1954, pp. 304-306. A discussion

continued on page 103

Gunite Foundries Celebrates Centennial

One hundred years ago the forerunner of Gunite Foundries Corp., Rockford, Ill., announced that it was open for business. Started by the great grandfather (D. Forbes) and the grandfather (A. D. Forbes) of the present chairman of the board, Duncan P. Forbes, the company advertised its line of castings and stoves in the weekly newspaper of the then tiny city five months after coming to Rockford from the east. D. Forbes (then 45) and A. D. Forbes (22) had come from Scotland sometimes between 1842 and 1844 and the father was engaged in the foundry business, first in Troy and later near Utica, N. Y. Coming to Rockford, they brought a considerable assortment of patterns for stoves and other castings, together with flasks and other foundry equipment.

Today, the fifth generation of Forbes is active in a modern foundry that produces high strength iron, malleable, pearlitic, and steel castings. A recently-enlarged machine shop enables Gunite to sell over half its production in the form of machined parts. Duncan P. Forbes was president of the American Foundrymen's Society during 1942-43.


The Democrat.

OFFICIAL PAPER OF THE CITY.

ROCKFORD, TUESDAY, AUG. 8, 1854.

EAGLE FOUNDRY.

D. FORBES & SON HAVING COMPLETED their new Foundry, (opposite Manny's Reaper Factory, West side,) respectfully announce to the public that they are now extensively engaged in the manufacture of

STOVES AND HOLLOW WARE,

of the latest and most approved patterns.
Columns and House Work of all kinds,
Wagon Skeins and Boxes,
Chain Pump Wheels with a new improvement,
Plough Castings, Sleigh Shoes, Steam and Water Pipe,
Cauldron Kettles, Iron Railing, Branding Irons,
and all kinds of work made to order. The

"FOREST CITY"

Cooking Stove. This new stove is offered to the public with full confidence that it will give complete and entire satisfaction. The plates are heavy and for solidity, beauty and economy it is unequalled. Also the new and beautiful elevated oven stove

"WESTERN WELCOME."

This new stove is got up with all the late improvements, and needs only to be tried to be appreciated. Also, two sizes of a new "Air Tight Parlor," which for beauty and economy stands *superior*. This stove can be rigged to burn wood or coal. Stoves repaired and old stoves taken in exchange for new, or cash.

The Proprietors have had a long experience in the business in the east, and have selected their patterns from the many in the east. Being practical men they will warrant their *Wares* to be equal in every respect to any in the country. We would solicit dealers in this City and surrounding towns to call and examine our Wares before going East. All orders or communications will receive prompt attention,

D. FORBES & SON.

Rockford, Aug. 7, 1854. 10

This advertisement in the August 8, 1854, Rockford (Ill.) *Democrat* announced the opening of what is now Gunite Foundries Corp. which is celebrating 100 years in the foundry business this year.

Shell Molding Film

Recent progress in techniques of shell molding is the subject of a new 18-minute film available from Monsanto Chemical Company's Plastics Div. Film traces the development of resin shell binders and describes techniques of shell production, shell assembly, and casting.

Requests for the film may be directed to Plastics Div., Dept. SM, Monsanto Chemical Co., Springfield, Mass.

List Alloy Steel Applications

Climax Molybdenum Co. has published a 208-page book entitled *Alloy Steels Pay Off* covering 60 case histories of alloy steel applications under the headings the part, the problem, and the pay-off.

Illustrated with numerous graphs and data tables, the book may be obtained at no charge by writing on company letterhead to Climax Molybdenum Co., 500 Fifth Ave., New York 36, N. Y.

Discuss Employment Fluctuations at N. F. A. Regional Meeting

Part of the group attending the June 3 Milwaukee Regional meeting of the National Foundry Association. Meeting was a panel session on "Providing for Employment Fluctuations;" 65 representatives of foundry management attended. At speakers table from left to right: Victor Harding, attorney, Whyte, Hirchboeck and Minahan; Russell Moberly, director, management center, Marquette University; E. F. Ohrman, labor relations manager, Allis-Chalmers Mfg. Co.; Summerfield Brunk, N.F.A. president; Arthur Hall, works manager, Nordberg Mfg. Co.; Bertram McNamara, staff representative, USA-CIO, District No. 32; Robert Gratz, attorney, IMFW-AFL, Local 125; and C. T. Sheehan, N.F.A. executive secretary.

Rapid Chemical Grading of Simple Brasses

C. GOLDBERG and P. SAFFER
New England Smelting Works, Inc.,

■ Rapid grading of simple brasses (copper and zinc) is frequently carried out by colorimetric measurement of the cupric ammonium complex. If traces of substances precipitable by ammonia are present, it is necessary either to filter or to complex the traces with citrate, tartrate, etc.

The absorption of light by solutions of cupric nitrate in the range 24-49.5 per cent copper has been studied. It was found that the curve obtained, while deviating a little from Beer's Law, was reproducible at every point within one per cent copper. The readings remained identical in unstoppered tubes for more than one hour, and in stoppered tubes for more than 24 hours. Based on these experiments, a procedure for the rapid grading of simple brasses has been developed based on the colorimetric measurement of cupric nitrate solutions.

Transfer a 0.5-gram sample of the brass to a 100-ml Pyrex volumetric flask and add 10 ml of nitric acid (reagent grade, diluted 1:1). Warm until solution is complete and the red nitrous fumes are expelled. Dilute to the mark with distilled water, mix well, and cool to room temperature. Determine the absorption in a colorimeter at 650 mμ. From a prepared calibration curve of the absorption of cupric nitrate solutions vs. copper content, read the per cent copper in the sample.

The above procedure has been found satisfactory for the estimation of the copper content of simple brasses within 99 per cent accuracy. The procedure is satisfactory with simple brasses containing only traces of iron and nickel. Complex brasses (copper and zinc with small amounts of tin, lead, iron, nickel, manganese, aluminum, etc.) may be dissolved in nitric acid, and citric acid added to complex the tin. However, results may be high if the iron in the sample exceeds about 4 per cent or the nickel 0.5 per cent. Therefore, the method is not recommended for complex brasses or for bronzes. — (Reprinted from *Chemist Analyst*, vol. 42, no. 4, Dec. 1953, p. 92.)

Light Metals Course

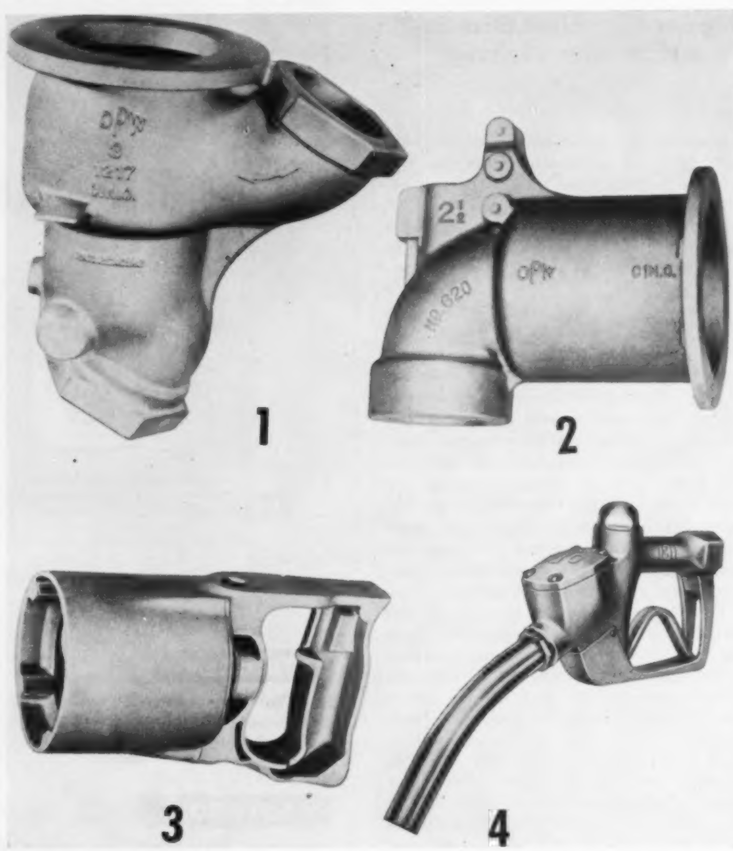
Massachusetts Institute of Technology will offer a special summer program, Casting of Light Metals, August 23 through September 3. Howard F. Taylor, professor of metallurgy, will direct the two-week program, assisted by other members of the M.I.T. staff and by guest lectures.

Included will be the following topics: metallurgy of melting and casting light metals; mechanism of solidification; behavior and control of gases in metals; gating and risering; heat treatment of light metal castings; welding of light metals; inspection and repair; and chemistry and mechanics of molding materials.

Tuition will be $160; academic credit will not be offered. Full details and application blanks are available at the Summer Session Office, Room 7-103, M.I.T., Cambridge 39, Mass.

Release Rules and Regulations

Over 5000 copies of the four-page rules and regulations governing the 1954 National Packaging and Materials Handling Competition have been mailed. Sponsored by the Society of Industrial Packaging and Materials Handling Engineers, competition is held in conjunction with the 9th Annual National Industrial Packaging and Materials Handling Exposition to be held in the Chicago Coliseum, September 28-30.



Here's How Frontier 40E aluminum alloy made it possible for the OPW Corp., Cincinnati, manufacturer of valves, fittings and assemblies for handling hazardous liquids, to make its product more attractive to the market and increased its acceptability. Through its use the company reduced the weight of its nozzles and fittings, thus facilitating handling and movement in service and eliminated operator fatigue. The use of Frontier 40E resulted in a light weight, easier handling product without loss of strength or resistance to corrosion. Another advantage was that nozzles made from 40E are non-sparking. It was found that 40E aluminum alloy machines smoothly and faster and since alloy requires no heat treating, close tolerance could be maintained without danger of change. Pictured above are products manufactured by the OPW Corp. with Frontier 40E aluminum alloy. They are: 1, valve body; 2, bulk hose nozzle body; 3, casting produced under contract with original manufacturer, electric drill hand and housing; 4, automatic shut-off nozzle. Comprehensive engineering data book covering Frontier 40E aluminum alloy may be obtained by writing to *Frontier Bronze Corp.*

For more data, circle No. 436 on p. 17

Abstracts

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of iron-carbon-phosphorus systems and the eutectic structure of pure iron carbon alloys.

A495 . . "Eutectic Solidification," A. Hultgren, Y. Lindblom, and E. Rudberg, *Iron and Steel* (British), vol. 27, no. 7, June 12, 1954, pp. 306-310. A study, under accurately controlled cooling conditions, of the structures that develop in successive stages of freezing in the four common types of hypo-eutectic cast irons: gray iron with coarse graphite eutectic, gray iron with fine "undercooled" graphite, white iron, and mottled iron.

A496 . . "The Solidification of Nodular Iron," H. Morrogh, *Iron and Steel* (British), vol. 27, no. 7, June 12, 1954, pp. 310-313. Observations on the theory that hyper- and hypoeutectic nodular irons solidify by analogous mechanisms. Actual sequences, depending on proximity of the nodules, are stated.

A497 . . "Diffusion of Nitrogen in Iron," J. D. Fast and M. B. Verrijp, *Iron and Steel* (British), vol. 27, no. 7, June 12, 1954, pp. 313-314. An examination of the solubility and diffusion coefficient of nitrogen in iron, as functions of temperature. The authors are primarily concerned with the deleterious effect of nitrogen in ferritic steels, where its solubility is so small that its presence is always harmful.

A498 . . "Calcium Carbide Injection—A New Foundry Tool," J. M. Crockett and H. E. Henderson, *American Foundryman*, vol. 25, no. 4, April, 1954, pp. 34-43. Authors describe use of finely divided calcium carbide injected into molten iron by means of dry nitrogen for sulphur removal, use of more economical alloy additions, and to provide base for conversion to spheroidal graphite.

A499 . . "Establishing Standards for As-Cast Surfaces," R. A. Loder, *American Foundryman*, vol. 25, no. 4, April, 1954, pp. 44-45. Aluminum alloy surface comparison standards made by green sand casting of eight grades of sand paper.

A500 . . "Heat Transfer Characteristics of Metals Cast in Shell Molds," R. E. Morey, H. F. Bishop, and W. S. Pellini, *American Foundryman*, vol. 25, no. 4, April, 1954, pp. 46-50. Experiments show that solidification characteristics of metals cast in shell molds with backup are similar to those of sand castings. Without backup, differences are dependent on specific conditions.

A501 . . "Pouring Temperature Effect on Steel Castings," C. F. Christopher, *American Foundryman*, vol. 25, no. 4, April, 1954, pp. 51-55. Steel temperature, as it enters the mold, controls or influ-

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DOUBLE END DICK

By my locker one day, at the end of my trick
I heard the boys talk about Double End Dick.

Said one, "Old Dick ain't so good with a rammer.
He can't use a lifter, he can't swing a hammer.
He rods his cope wrong, puts his wash on too thick,
But he sure is a whiz with a double end slick."

Said another, "I hear that down on the farm,
Old Dick by himself built his own house and barn.
With a saw or a hammer he struck not a lick;
He did all the work with a double end slick."

"I remember one day when my watch wouldn't run,"
Chimed in some lying son of a gun,
"Old Dick took it over and soon made it tick.
And all that he used was a double end slick."

With his double end slick he nails and he patches.
With his double end slick, when he itches, he scratches.
And I've heard a rumor (they can't make it stick),
That the guy even eats with a double end slick.

Old Dick, in the shop, said, "Look at the fools
Coming to work with an armload of tools,
All a good molder needs, if he's careful and quick,
Is a strong pair of hands and a double end slick."

One day when old Dick was out on a bender,
He came to grief, smacking another guy's fender.
Before he had time for another quick snort
He found himself facing a magistrate's court.

Said Dick to the judge, "I'll admit I was tight,
But give me a chance, I'll make everything right.
That dent in his fender is only a nick.
I can fix it like new with my double end slick."

Said the judge, "all this trouble was brought on by drink
And therefore I give you six months in the clink."
Then he smiled and exclaimed, "Now, you wily old hick,
Let's see you fix that with your double end slick!"

That's the story of Double End Dick as you see,
And if you believe it, you're crazy as me.

From *Rammed Up and Poured,* book of foundry poems by Bill Walkins, obtainable from the copyright owners: Electric Steel Foundry Co., 2141 North West 25th Ave., Portland 10, Oregon. Price, $1.85.

CLASSIFIED ADVERTISING

POSITIONS WANTED

Seeking supervisory position with foundry. Eighteen years of practical experience in all types of metals and alloys, castings up to 25 tons. Supervised one of the foremost foundries in the country in shell molding for two years. Willing to travel. **Box B35, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

SUPERINTENDENT OR GENERAL FOREMAN. Practical man—30 years jobbing experience on light and heavy gray iron castings. Also nonferrous castings, green and dry sand. Experience in all phases of foundry. Well versed on cupola. Can get production. Age 48. Married. Now employed. Can furnish references. **Box B37, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

PERMANENT MOLD EXPERT. Available for consulting or permanent employment. Has designed molds and equipment for several leading producers of copper-base and aluminum castings. Experienced in pressure, gravity, vacuum and centrifugal methods. Experienced patternmaker, tool and moldmaker. Willing to relocate. **Write Box 40, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Illinois.**

HELP WANTED

STEEL FOUNDRY GENERAL FOREMAN. Steel foundry making about 400 N. T. castings per month from 50 to 20,000 lb requires a General Foreman. This man would be responsible to the Superintendent for production and efficiency of all departments except melting. Experience in molding and core-making on castings from 10,000 to 20,000 lb and experience in working on an incentive basis desirable. **Dominion Engineering Works, Ltd., P.O. Box 220, Montreal, Que., Can.**

HELP WANTED

SALES ENGINEER. One of largest producers and sellers of ferro-alloys, located in Midwest, wants experienced foundryman with background in alloy usage and metallurgy to work as adviser to producer and distributors. Age 30 to 45; sales personality. Some travel required. Send photo and résumé of experience and education. **Box B36, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

SALESMAN — By long established manufacturer of refractories. Applicant should have experience in industrial selling, preferably to metal melting industries. Prefer applicant between 27-35 years. Must be willing to travel. **Box B38, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

SALES ENGINEER. Real opportunity working for malleable foundry in Michigan. Must be willing to spend 50% of time traveling. Foundry background necessary requisite. In reply state age, résumé of experience, education and salary desired. **Address Box B39 AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOREMAN

Gray iron foundry in Cleveland, Ohio area needs molding foreman with production experience. Good opportunity for the right man.

Box B41

AMERICAN FOUNDRYMAN
616 S. Michigan Ave.
Chicago 5, Ill.

ENGINEERING SERVICE

EARL E. WOODLIFF,
Foundry Sand Engineer.
Consulting . . . Testing.
14611 Fenkell (5-Mile Rd.) Detroit 27, Mich.
Res. Phone Vermont 5-8724

Abstracts

continued from page 103

ences solidification pattern, strength of deoxidizers present, and, indirectly, oxygen level at the time. When freezing begins, the temperature of pouring and its deoxidizer influence on oxygen determine susceptibility to porosity and iron sulphide precipitation.

A502 . . "Gating and Risering of Magnesium Alloys—Part 1," H. E. Elliott, *American Foundryman,* vol. 25, no. 4, April, 1954, pp. 56-62. In casting magnesium alloys, gating or running will control mold-filling defects; solidification defects are controlled by good risering or feeding practice. Author presents review of riser and feeding fundamentals for magnesium alloys, also treats chilling practice.

A503 . . "Recommended Names for Gates and Risers," (Foundry Facts), *American Foundryman,* vol. 25, no. 4 April, 1954, pp. 63-65. Illustrated charts listing recommended terminology for foundry gating and risering practice.

A504 . . "Fluidity vs Core Blows in Automotive Gray Iron," A. A. Evans, *American Foundryman,* vol. 25, no. 4, April, 1954, pp. 66-68. Description of fluidity test used to set up controls and measure flow characteristics in gray iron core work. From investigation of flow properties of iron and their effect on casting quality.

A505 . . "Gating Yellow Brass Castings for Greater Production Economy," C. L. Mack, *American Foundryman,* vol. 25, no. 4, April, 1954, pp. 70-74. A flexible, effective approach to regating several hundred thin patterns, worked out by combining the author's experience and the recorded experiences of other foundrymen.

Foundrymen Sing with Hermit Club

Foundrymen were prominent in the roster of the Hermit Singers, who entertained at the annual banquet during the recent AFS Convention and Exhibit at Cleveland.

Carl S. Mayer, Sr., president, Carl Mayer Corp., Cleveland, sang tenor solo in one of the numbers, "The Whiffenpoof Song." Among others in the club were Sterling N. Farmer, vice-president, Sand Products Corp., Cleveland; Harold McArt, Aluminum Co. of America; and R. E. Delamater, Foote-Burt Co.

Mr. Farmer was recently elected president of the Hermit Club, of which the Singers is a member group, and which is now celebrating its 50th anniversary as a talent club in Cleveland.

Mr. Mayer has been singing for a hobby for some years and was top tenor with the Ramblers Quartet, 1946 Ohio State Champions.

Advertisers and their Agencies

This index is published as a convenience to the readers. While every care is taken to make it accurate AMERICAN FOUNDRYMAN assumes no responsibility for errors or omissions.

Two long-active members of the Chicago Foundrymen's Association were presented testimonial plaques at the group's annual spring festival at Brookwood Country Club, Addison, Ill. From left: C. A. Larson, Reliance Pattern Works, association president; C. V. Adams, Vulcan Iron Works, plaque recipient, and association secretary-treasurer; R. D. Phelps, Jr., Francis & Nygren Foundry Co., past-president; and honoree C. T. Milles, C. H. Milles Foundry Co.

Bob Thompson (left), Canadian Car & Foundry Co., Ltd., demonstrates effectiveness of Longue Pointe Foundry's new dust collection system during recent open house following a $4 million modernization program. Others, from left, J. E. Clubb and K. S. Gordon, Canadian Car & Foundry Co., Ltd.; A. Duperon, Montreal Transportation Commission; A. Mailman, Mailman Corp., Ltd.; and E. W. Wilson, Canadian General Transit Co.

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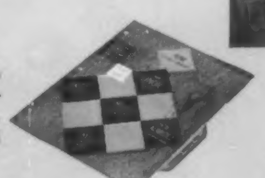

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